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VACCINATION BY MOUTH AGAINST BACILLARY DYSENTERY

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DISCUSSION OF METHOD

Vaccination by mouth is not a new method. Pasteur (1880) showed that some immunity followed the feeding of anthrax spores to sheep, and that considerable resistance was shown by chickens fed with the cholera vibrio. This method was also used more than 30 years ago by Ehrlich (1891) for the production of antiricin and antiabrin in laboratory animals. Renewed interest has been brought about largely by the work of Besredka (1919 et seq.). He stressed the addition of bile as a necessary adjunct to certain of the bacilliary vaccines (typhoid, cholera), claiming that the eroding action of the bile upon the intestinal mucosa would bring about intimate contact of the ingested micro-organisms and the deeper-lying cells of the intestinal wall. This, he concluded, would render such cells able to withstand future invasion of living organisms, thus offereing an effective barrier against a generalized infection. Calmette (1923) questions the erosive action of the bile. He points out that the epithelium of the mucosa is never sufficiently intact to prevent the entrance of bacteria, and that, moreover, the gastric, biliary, and intestinal gland secretions must dissolve and digest large numbers of living and dead bacteria. He believes that the continuous or intermittent action of the products of this lysis may bring about immunity to certain species of bacteria which have become adapted to life in the digestive tract. Our own experiments lead us to believe that very large amounts of bile are necessary in order to bring about diarrhea or other readily observable pathological condition. The few sections made did not demonstrate erosion. In order to give to human beings, doses equivalent to those producing definite pathological conditions in the rabbit, amounts varying from 100 to 200 c. c. might have to be used. Perhaps even more than this would be required, provided the susceptibility were more or less the same.

Besredka's theory of local immunity is not new. Loeffler (1906), in working with mouse typhoid, expressed much the same view as did others following him. The theory of local immunity was sug-

gested to these early investigators largely because they could not demonstrate with any degree of constancy (and frequently not at all) certain antibodies (e. g., agglutinins, bacteriolysins, etc.) in the blood stream of the animals vaccinated by mouth. And yet these animals could resist infective doses of the particular organisms used. Loeffler (1906) believed that it was no doubt due to cellular action, either of the epithelial cells themselves, or of the leucocytes, which, he points out, are so abundant in the intestinal canal.

Vaccination by the subcutaneous route against bacillary dysentery was attempted soon after the discovery of the causal organisms. It was found very early, however, that the reactions were extremely severe, especially with the Shiga type (*Eberthella dysenteriae* Shiga), death following in a few instances in man, and in many of the animals. Quite naturally, then, when it was shown that much larger doses of vaccines prepared from other organisms could be administered by mouth, vaccination by mouth was undertaken against bacillary dysentery. Zeitlin (1905) was not able to demonstrate agglutinins following the administration of the Shiga type (human). Hida and Toyoda (1907) showed antibody response following the ingestion of Shiga dysentery bacilli previously digested with pepsin and trypsin. Shiga (1908–9) used heat-killed organisms and succeeded in developing some immunity.

Chvostek (1908) used killed Shiga bacilli and demonstrated a small quantity of antitoxin in the blood of a part of the treated animals.

Dopter (1908) fed mice definite amounts of dried dysentery organisms previously killed by heat and found that the mice developed a certain degree of immunity 10 to 12 days after administration of the first dose, but that this immunity did not appear to last beyond 30 days. Later (1909) he used sensitized dysentery bacilli. The organisms were treated with immune serums; and, after agglutination had occurred, the precipitate was dried and used as the vaccine. By this method he found the immunity was of longer duration (four months), and no severe reactions followed. He did not consider that the method of administration of dysentery bacilli to man by mouth would be very practicable.

Besredka (1919 et seq.) used both killed and living vaccines. He considered that the natural immunity of rabbits against typhoid and paratyphoid depended upon the integrity of the intestinal mucosa; so that when the intestinal mucosa is more or less denuded, the vaccine may come into close contact with the underlying cells and resistance be established. To bring about this erosion, Besredka administered ox bile in 8 to 10 c. c. amounts on the day prior to the ingestion of the vaccine. The bile was mixed with licorice powder in some instances. On the following morning the animals (kept

without food) were given a second dose of the ox bile, and 2 hours later the vaccine was administered *per os* by means of a small catheter.

He attempted in the following way to show that the resistance resulting from this method of vaccination resided in the intestinal wall:

Rabbits were prepared with bile and then given *per os* a sublethal dose of paratyphoid B bacilli (*Salmonella schottmülleri*). The agglutinin titer and the other (protective) antibodies rose rapidly and reached their height at the twenty-fifth day. On that day the agglutinin titer varied from 1: 20,000 to 1: 80,000 (different animals). At the end of two months the agglutinins were found to be rapidly diminishing. The ingestion at this time of a second dose of living bacteria plus bile did not result in a second increase in the agglutinins and protective substances. On the contrary, the agglutinins two months later had dropped to 1:200 and 1:400. Besredka assumed, therefore, that the first ingestion of the living bacteria produced an impermeability of the intestinal wall which prevented the living bacteria and their endotoxin given with the second dose from passing through into the general circulation and causing the formation of immune bodies. He believed that the immunity was more lasting if living bacilli were administered. Subsequent experiments enabled him to conclude that ox bile was not necessary in case of the dysentery bacilli of the Shiga type, since the organisms themselves exerted an erosive action upon the intestinal mucosa.

Following the work of Besredka, a number of investigators again took up the problem of vaccination by mouth against various intestinal infections. The use of this method presented itself as a problem of importance, because Besredka's advocacy of its use in human beings was followed very soon by the sale of vaccine "pellets" for such purposes. These pellets consisted of the dried vaccine, and were to be administered with the bile "pills" in most cases. According to the reports so far received, the trials with this commercial "bilivaccine" in foreign countries have been very successful. The results obtained, however, must be analyzed very critically before definite assertions are made as to the value of the treatment.

Zingher and Soletsky (1920) attempted to verify the work of Besredka in so far as it applied to animals. They experimented with *Salmonella schottmülleri*. They concluded that no immunity was produced in rabbits prepared with ox bile, and fed living or dead paratyphoid B bacilli. No agglutinin production was noted in these rabbits.

Kanai (1921) decided that a certain small degree of immunity was produced in rabbits by the oral administration of *Eberthella dysenteriae* Shiga.

Nicolle and Conseil (1922) submitted some evidence as to the efficiency of this method in man. Their experiments were conducted in Tunis. They point out the difficulties involved in determining the efficiency of dysentery vaccine administered by the oral route. Among other things the natives of this area are quite resistant to dysentery, due, so the investigators believe, to the consumption of polluted water in infancy; also, they found the virulence of the dysentery bacilli to be extremely variable. They finally secured a virulent strain and performed the following experiment: Cultures were sterilized at 75° C., then doses of 100 thousand millions were administered on the same days, both of the subjects fasting before and after the ingestion of the vaccine. Two other subjects were held as controls. The same dose was repeated on the second, third, and fifth days. On the fifteenth and eighteenth days after the last ingestion, the test doses of virulent bacilli were given (10 thousand millions of Shiga organisms). No illness occurred among the vaccinated subjects. Their serum showed no agglutinating power, even after the test dose. The two controls contracted a definite dysentery. The Shiga bacillus was isolated from the stools. The administration of antidysenteric serum resulted in prompt alleviation of the symptoms.

Anglade (1924) followed the procedure of Besredka in the vaccination of both the civil and military population of a garrison at Versailles in 1923. The vaccinations were made during an epidemic of Shiga and Hiss dysentery. Five hundred and forty-six persons were vaccinated, among whom there were 42 cases, or 7.7 per cent. Among the 586 nonvaccinated persons there were 253 cases, or 43 per cent.

Antonovsky (1924) also tried vaccination by mouth against an epidemic of dysentery in an asylum at Petrograd in 1923. The first case appeared July 13, and the vaccinations were begun July 31 and completed August 3. The total number of persons in the asylum was 2,768, one thousand of whom were vaccinated. At the end of September there had occurred 12 cases among the vaccinated, or 1.2 per cent, and 56 cases among the unvaccinated, or 3.1 per cent. Of the 12 cases occurring among the vaccinated, 9 came down during the first 10 days after the vaccination.

Lesbre and Verdeau (1924) found that the immunity was rather slow to appear when this method was used (rabbits). Their best results, and these were rather poor, were obtained when the final test dose was given 40 days after the last dose of vaccine.

Pascal (1924) reported upon a Flexner dysentery epidemic at a departmental insane asylum at Chalons-sur-Marne, in 1923 and 1924. He used the oral route for vaccination of 399 occupants out of a total of 410. Among the 399 vaccinated, only 3 cases occurred (0.7 per

cent). In 1923, out of a total of 256 occupants, none vaccinated, there were 65 cases (25.3 per cent). He does not say whether or not the occupants were in some cases the same persons in both years.

Gauthier (1924) tried vaccination against dysentery by the oral route among the Greek refugees. No infection was known to have occurred among the 29,880 persons vaccinated, although the disease continued to prevail among the unvaccinated groups. Agglutinins in high titer were found in the serum of those who had ingested the vaccine.

EXPERIMANTAL DATA

Technique.—In the first five experiments a No. 7 silk thread zebra catheter was used for the administration of the vaccine. In the subsequent experiments we used a small wooden mouth gag with a central opening through which a pipette or a syringe without needle was inserted. The animals swallow the fluid readily and the method is very rapid. No food was given for 18 hours prior to the administration of the vaccine.

In all of the later experiments young cultures were used, that is, those not over six hours old. The mortality was thus lessened. The majority of 18 to 24 hour cultures (solid media) of the Shiga type are toxic. The organisms were grown on 1 per cent glucose agar in Blake bottles, taken up in 0.85 per cent sodium chloride solution, killed by heat at 56° C. for 10 minutes, or 60° C. for 1 hour, or by 0.5 per cent phenol, then diluted to a definite turbidity with the aid of the nephelometer. The various doses and various methods of killing the cultures were used in order to give as many organisms as possible with least danger. As an initial dose (Shiga type) for intravenous or subcutaneous vaccination, 20,000,000 organisms were found to be fairly safe and 100 to 200 times this dose for the *per os* vaccination. Actual count of the organisms was not made in any case. Counts previously made enabled us to assume that at least 2,000,000,000 organisms were present in each cubic centimeter of a suspension having a turbidity of 1,000 parts per million.

The toxicity of the cultures is variable, due to unknown conditions. Using the same medium, strain, temperature, and period of incubation, differences still occur. In increasing the subsequent doses, care is therefore necessary. At times we have been able to double and triple the initial dose without great loss of our test animals; at other times heavy losses resulted. Variation in animal resistance is, of course, one factor. In the experiments now under way, dried organisms are being used, since we have found that in the dried condition the toxicity does not vary in any marked degree if the material is kept in a dry, cold atmosphere (desiccator over sulphuric acid, temperature not over 15° C.).

Ten experiments are summarized in Tables 1 to 5. More have been performed, but the virulence of the living cultures is variable, as is well known by all workers on bacillary dysentery. This has necessitated the repetition of a number of tests, since in most cases the test dose of living culture was given intravenously. Only those tests in which all of the control animals (3 to 6 in each test) died are included in this report. In those cases in which the test dose was given by mouth, we could regard it as a fourth vaccinating dose and repeat the living culture in greater concentration or by the intravenous route.

In some of the experiments the vaccinating doses were given on 3 successive days, with a 7 to 10 day interval, followed by three more daily doses, then the test dose 10 to 18 days later. In the majority of the experiments, however, the usual three doses were given one week apart, with the test dose 10 to 15 days after the last ingestion. In some cases the bile was given the day before, in others just a few minutes prior to the ingestion of the culture; and in some of the later experiments no bile at all was used, since as good results seemed to be obtained without the bile and the fatalities were slightly reduced.

A few experiments have been conducted with the Flexner type (*Eberthella paradysenteriae*). Not enough work has been done to make certain of more than one thing: Very much larger doses can be used than would be considered safe in case of the Shiga type. Very young rabbits are sometimes sensitive to amounts of 2 c. c. of a heat-killed saline suspension of Flexner type organisms standardized to a turbidity of 1,000 parts per million. Full-grown animals may safely be given 5 to 10 c. c. of such a suspension, provided young cultures (4 to 6 hours) are used. It is no easier to determine the test dose in case of this type than it is with the Shiga type; consequently large numbers of animals must be used if the results are to be considered trustworthy. In either case the lethal dose must be large enough to insure significant results in spite of animal and cultural variability, and yet not so large as to involve the question of death being due to toxicity. Under certain conditions the Flexner type is capable of producing toxin also; hence a vaccine for human use should be tested first on animals.

Table 1.—*The protection afforded by three different methods of vaccination. The protection percentage is based upon the actual number of animals surviving all three vaccinating doses and receiving the test dose of living organisms*

Vaccinated by mouth		Vaccinated intravenously		Vaccinated subcutaneously	
Number of rabbits receiving test dose	Per cent survival	Number of rabbits receiving test dose	Per cent survival	Number of rabbits receiving test dose	Per cent survival
4	50				
15	73				
7	42				
13	30	4	0	4	75
11	63	3	66	4	75
8	75	4	75	6	83
9	55	3	66	5	100
12	66	5	40	4	50
14	50	4	25	5	60
13	61	5	40	4	50
Total animals.. 106		28		32	
Per cent survivals...	57		45		70

While the greatest protection is shown by vacination by the subcutaneous route, 57 per cent is very encouraging for the oral method of vaccination. All of these experiments, as already stated, were performed with *Eberthella dysenteriae* Shiga; and from our knowledge of the action of test doses of living bacilli we must assume that at least some of the protection afforded is in the nature of resistance to the toxin injected with the organisms or subsequently liberated. In other words, when immunization occurs, some antitoxin is formed. Death does not occur rapidly in rabbits when living organisms are injected, unless enormous doses are used, and in the latter case the deaths are in a large proportion of cases due to the toxin injected, as can readily be shown at autopsy.

Table 2.—*The protection afforded by vaccination by mouth, with beef bile and without beef bile. The protection percentage is based upon the actual number of animals surviving all of the vaccinating doses and receiving the test dose of living organisms*

With bile		Without bile	
Number of rabbits	Per cent survival	Number of rabbits	Per cent survival
4	75		
		3	66
15	73		
11	45	5	20
8	37	6	50
10	30	5	60
8	50		
3	33	5	100
4	50	5	60
Total animals...63		20..	
Average protection..	49		59

Table 2 indicates that the advantage lies with the organisms alone without bile. It is hardly fair, however, to compare the results in

the case of 29 animals with the results using 63. Yet, even considering that there is practically no difference in the protection obtained, since greater risk is involved when the beef bile is used, it may be concluded that beef bile can be eliminated without disadvantage.

TABLE 3.—*The danger involved in the three methods of vaccination. The total number of animals receiving the first dose of vaccine, with the fatalities resulting from this initial dose, is shown in each case*

By mouth		Intravenously		Subcutaneously	
Number of rabbits	Number of deaths	Number of rabbits	Number of deaths	Number of rabbits	Number of deaths
5	1	6	6	6	6
11	4	3	0	----------	----------
15	0	6	2	6	2
8	1	6	5	6	5
16	4	3	3	3	1
16	5	6	4	6	4
16	9	6	2	6	0
14	4	6	3	6	1
16	7	6	3	6	3
16	5	6	0	6	0
133	40	54	31	51	22
Per cent fatality..30		----------	57	----------	43

In Table 3 it is shown that the greatest danger follows the use of the intravenous method, as would naturally be expected because of the toxin content of the vaccine. There is no great difference between the subcutaneous and *per os* methods; but the advantage is in favor of the *per os* method, and this advantage appears still greater when consideration is taken of the very much larger doses which with safety may be given by this method.

TABLE 4.—*Comparison of the danger involved in per os vaccination with and without beef bile. The total number of animals receiving the first dose of vaccine, with the fatalities resulting from this initial dose, is shown in both cases*

With bile		Without bile	
Number of rabbits	Number of deaths	Number of rabbits	Number of deaths
5	1	----------	----------
6	3	----------	----------
		2	1
15	0	----------	----------
9	5	----------	----------
10	2	----------	----------
10	3	6	1
10	5	6	3
		6	4
8	4	6	1
10	6	6	1
16	14	----------	----------
16	5	----------	----------
115	48	32	11
Per cent fatalities. 42		----------	34

There is not must difference in percentage fatality shown in Table 4 between the vaccination by mouth after preparation by means of bile and without the bile. The slight difference is, however, in favor of vaccine without bile. Certain samples of beef bile are in themselves toxic to rabbits in the same doses previously proved to be satisfactory, using other lots. Besredka does not consider that the bile is necessary in case of the Shiga type, since this organism alone is known to produce injury in the large intestine.

SUMMARY

(1) It is pointed out that the method of vaccination by mouth is not new. It was used more than 19 years ago in an effort to produce immunity to the Shiga type of bacillary dysentery. Renewed interest in the problem followed Besredka's experiments, in which he introduced the use of beef bile as an erosive agent, preparing the way for the entrance of the subsequently ingested bacilli into the deeper lying cells of the mucosa which he considered responsible for the local immunity.

(2) A brief review of some of the early work is given, and also of the work done since Besredka's experiments, including a few of the experiments (foreign) on man. These experiments are somewhat contradictory in that at least a part of the animal experiments do not seem to confirm the work of Besredka, while all of the human experiments favor this method of vaccination. The human experiments are, however, too few in number to warrant definite conclusions.

(3) The author's experiments with rabbits (detailed in Tables 1 to 4) show that the greatest protection (70 per cent) was afforded by the subcutaneous method, but that a fair degree of protection (57 per cent) resulted from the vaccination by mouth, and that there was much less danger involved in the use of the latter method. Beef bile is shown not to be necessary in vaccinating by mouth against the Shiga type of bacillary dysentery.

CONCLUSIONS

While the method of vaccinating by mouth against the Shiga type of bacillary dysentery should still be considered in the experimental stage, two facts are evident:

(1) The danger and discomfort are too great to recommend the use of the subcutaneous method of vaccination against the Shiga type of infection.

(2) Since vaccines can be so prepared that no danger nor discomfort follows their ingestion, and since at least some immunity is shown to follow such procedure, vaccination by mouth is apparently worthy of further trial.

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STUDIES ON OXIDATION-REDUCTION

VII. A STUDY OF DICHLORO SUBSTITUTION PRODUCTS OF PHENOL INDOPHENOL

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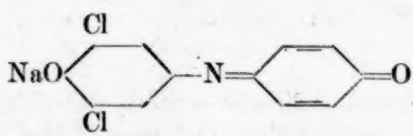
Introduction

In this paper are presented electrometric data on a series of substituted dichloro indophenols which possess properties of possible value in the colorimetric estimation of oxidation-reduction levels. Like the dibromo compounds reported in Paper VI (Reprint No. 915), the dichloro compounds retain their brilliant blue color in mildly acid solutions and are also among the more stable of the indophenols. Moreover, the dichloro compounds are easy to prepare and purify for use.

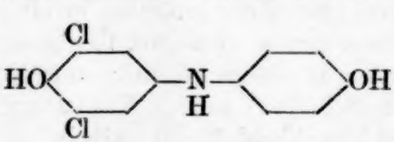
Description of Preparations

The seven preparations investigated in this paper are—

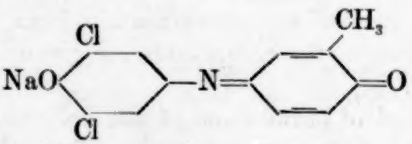
No. 1 (Lab. No. 11)—Phenol indo 2, 6-dichlorophenol:



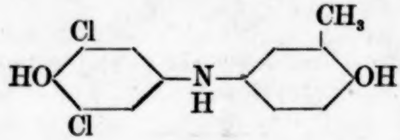
No. 2 (Lab. No. 11a)—Leuco derivative of No. 1:



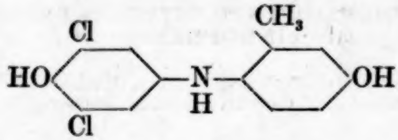
No. 3 (Lab. No. 12)—o-Cresol indo 2, 6-dichlorophenol:



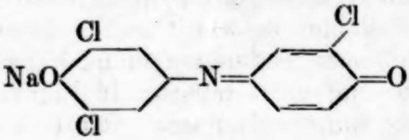
No. 4 (Lab. No. 12a)—Leuco derivative of No. 3:



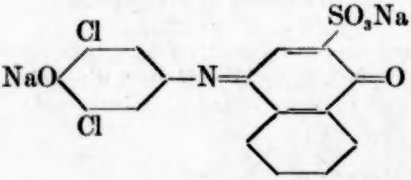
No. 5 (Lab. No. 3a)—Leuco m-cresol indo 2, 6-dichlorophenol:



No. 6 (Lab. No. 14)—o-Chlorophenol indo 2, 6-dichlorophenol:



No. 7 (Lab. No. 15)—1-Naphthol-2-sodium sulphonate indo 2, 6-dichlorophenol (Schäffer's salt indo-2, 6-dichlorophenol):



These will be described briefly, a more complete discussion of the history, chemistry, preparation, and uses of the indophenols being reserved for a future communication.

They were all made by the interaction in alkaline solution of 2, 6-dichloroquinonechloroimide with (No. 1) phenol; (No. 3) o-cresol; (No. 5) m-cresol; (No. 6) o-chlorophenol; and (No. 7) 1-naphthol-2-sodium sulphonate (Schäffer's salt). Nos. 2 and 4 were obtained by the reduction of Nos. 1 and 3, respectively.

The sodium salts of these indophenols were repeatedly purified by solution in water and salting out with sodium chloride. The leuco derivatives were purified by crystallization from dilute ethanol or methanol. Analyses of the compounds are given in Table 1 (at the end of the paper).

From the method of purification of the sodium salts of the indophenols, by salting from solution with sodium chloride, some salt always appears in the purified product. Since this impurity is of no

disadvantage in the employment of the compounds, the method affords the simplest procedure for purification.

The drying of the preparations, since most of them are sensitive to heat, was done at room temperature in a vacuum desiccator with soda lime, and often required weeks. For analytical purposes, the moisture was determined by drying in a Schmiedeberg vacuum apparatus at 100°.

The titanium trichloride titration of many of the compounds leaves much to be desired. In some cases the per cent purity by calculation from the analytical data is checked by the titanium trichloride method. In the majority of the compounds the latter method proved quite unsatisfactory, and in such cases we regard the calculated purity as the more accurate. The titanium reduction method can not be applied uniformly to all these compounds, but must be modified in certain details for each preparation investigated.

The amounts of sodium chloride and of sodium indophenol are calculated from the determinations of sodium and moisture by the method of indirect analysis as follows: The mixture analyzed consists of water, NaCl and Na indophenol. Then

$$\begin{array}{ccccc} 100\% - \%\ \text{moisture} & = & \text{per cent NaCl} & + & \text{per cent Na indophenol, or} \\ a & = & x & + & y \end{array}$$

If we let $m = \dfrac{\text{NaCl (molar wt.)}}{\text{Na indophenol (molar wt.)}}$,

then $x + my = b$, where b is the percentage of NaCl equivalent to the total Na analytically determined. Solving the above equations gives

$$y = \frac{a-b}{1-m}$$

The purity of the compounds = 100% − NaCl − moisture, except in the case of compound No. 4, which is considered to contain 1 mol. of water of crystallization. The chlorine in organic combination is the difference between the total chlorine and that in the sodium chloride.

The leuco compounds yielded almost ideal analytical results; and electrometric measurements upon them would have been highly desirable. With one exception, however, they were too difficult to handle, owing to their very low rate of solution, even in the alkaline, de-aerated buffers. Attempts to form the more readily soluble sodium salts by mixing with the calculated amounts of de-aerated NaOH resulted apparently in a partial decomposition.

Oxidation-Reduction Electrode Measurements

The electrode potential measurements were made with the equipment described in previous articles of this series, and the procedure

followed was essentially the same as that used with the other indophenols discussed in Papers III, V, and VI. The buffer solutions employed in the present measurements at constant hydrion concentration had the same compositions as those described in Paper V, Table 1. They were measured with the hydrogen electrode in a dilution of 50 c. c. buffer to 5 c. c. water, this being a first approximation to the pH of the dilution of 50 c. c. buffer to 5 c. c. aqueous dye solution [1] actually used in the oxidation-reduction electrode measurements.

The method of titration was used in determining the potential (E'_o) characteristic of a 1:1 mixture of oxidant and reductant at constant hydrion concentration. With leuco indigo disulphonate as a reducing agent, this method gave uniform results in the titration of the oxidized form of the compounds studied (see tables at the end of this paper). On the other hand, the titrations of the leuco derivatives with ferricyanide as oxidizing agent were far from satisfactory. Only one of these compounds, leuco phenol indo 2,6-dichlorophenol yielded stable and consistent electrode potentials. (See Table 4.) The leuco derivatives of the o-cresol and m-cresol substitution compounds behaved unsatisfactorily toward the electrode and were discarded.

The measurements of E'_o at different pH levels were carried through without difficulty except at each limit of the pH range studied. At the acid limit (near pH 5) the indophenols tend to precipitate; and at the alkaline limit (near pH 11) there is a drift in the electrode potentials to the negative side as if decomposition were occurring. The latter drift was least evident in the case of the simple phenol indo 2,6-dichlorophenol and greatest in the case of the o-chlorophenol derivative.

The electrode equation relating electrode potential to hydrion concentration (the derivation of which has been described in Paper III) is

$$E_h = E_o - 0.03006 \log \frac{[S_r]}{[S_o]} + 0.03006 \log \left[K_r K_2 [H^+] + K_r [H^+]^2 + [H^+]^3 \right] - 0.03006 \log \left[K_o + [H^+] \right], \text{ (at } 30^\circ \text{ C.)}, \qquad (1)$$

Here, E_h is the observed potential, and E_o is the potential when $[H^+] = 1$ and the ratio $\frac{[S_r]}{[S_o]} = 1$. $[S_r]$ is the concentration of total reductant, and $[S_o]$ the concentration of total oxidant. K_o is the acid dissociation constant of the oxidant, K_r is the dissociation con-

[1] The concentration of the dye solution was in all cases less than 0.006, molar, while that of the buffers was about 0.1 molar.

stant of the hydrogen in the reductant to which K_o applies in the oxidant, and K_2 is the dissociation constant of the phenolic group created by reduction.

The data reported here and plotted in Figure 1 are given for the systems containing oxidant and reductant in equal proportions, i. e., when $\frac{[S_r]}{[S_o]}=1$. In other words, when this ratio is unity in equation (1), E_h is termed E'_o.

In Figure 1 the experimentally determined points are appropriately marked, whereas the curves show the values calculated by means of

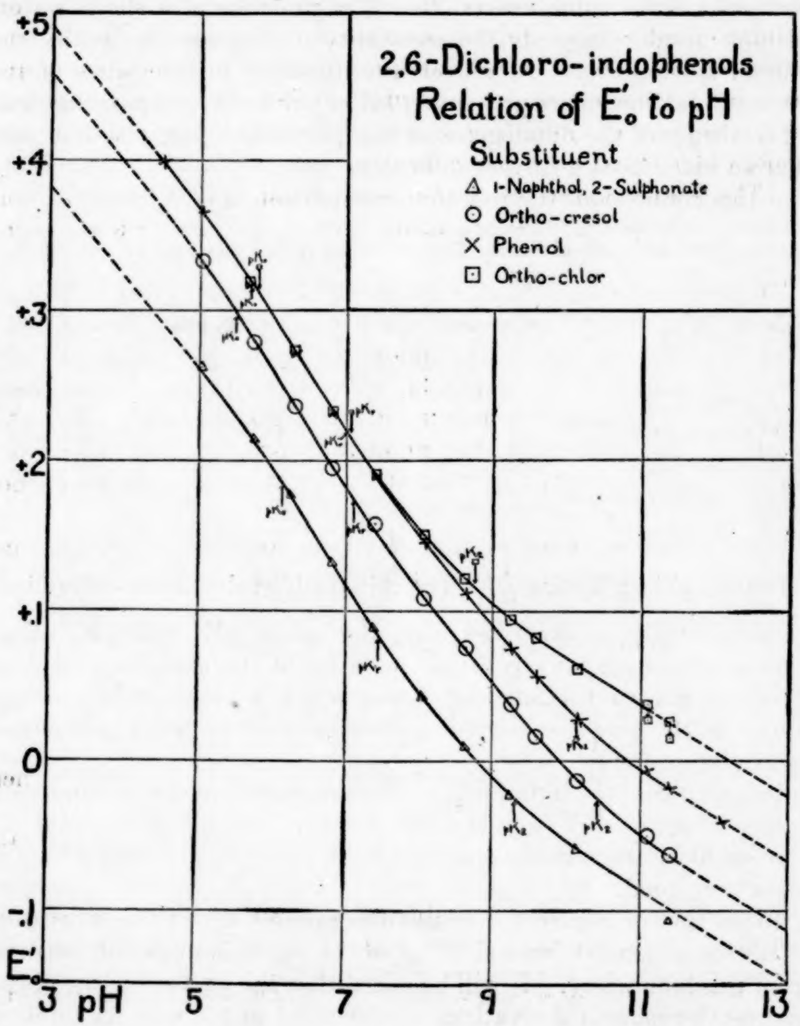


FIG. 1

equation (1). The curves are extended as broken lines in the extremes of acidity and alkalinity where the experimental values are uncertain, for the reasons already indicated. The centers of inflection of these curves were found as previously described and are indicated by arrows.

It will be recalled that the acid dissociation constants, K_o, of the oxidants in the simple indophenols were determined colorimetrically by the method of Salm. These were in good agreement with the corresponding values found by the graphic method. However, in the 2,6-dichloro indophenols the method of Salm gave rather uncertain values for K_o. Thus, in the phenol compound it was found that very dilute solutions gave a pK_o value of 5.5, and more concentrated solutions gave a value nearer 5.8. The presence of a slight water-insoluble residue suggests the possibility of the interference by the color of an impurity. Moreover, the disparity in intensities of the acid and alkaline colors prevents good colorimetric comparisons, and the tendency of the dihalogenated indophenols to precipitate in acid solution introduces a further difficulty.

In this connection, the following comparison is of interest:

Indo 2,6-dichlorophenol Series: Comparison of initial and final pK estimates

Compound No.	Substituent	pK_o	pK_r	pK_2
1	Phenol {initial	5.5–5.85	6.94	10.10
	Phenol {final	5.70	7.00	10.13
6	o-Chlorophenol {initial	5.5–5.6	6.80	8.80
	o-Chlorophenol {final	5.8	7.05	8.75
3	o-Cresol {initial	5.5–5.70	6.98	10.40
	o-Cresol {final	5.5	7.10	10.43
7	1-Naphthol-2-sulphonate {initial	5.9–5.95	7.36	9.45
	1-Naphthol-2-sulphonate {final	6.14	7.45	9.32

In this table, $pK = \log \frac{1}{K}$. The initial pK_o values were determined colorimetrically as described; and the initial pK_r and pK_2 values were obtained graphically from the chart of the experimental data. The final pK values listed are those which when used in the type equation (1) give the nearest approximation to the experimental values found for E'_o.

It is seen that the initial pK_o values are uncertain and in some cases diverge considerably from the final values. On the other hand, the agreement between initial and final values for pK_r and pK_2 is in most cases very good.

Inspection of Figure 1 discloses the present E'_o : pH curves to be of the same general form as those of the other indophenols reported from this laboratory. It will be noted that the curves for the phenol and o-chlorophenol derivatives are identical in the acid region down

to about pH 7.0, and that the o-chlorophenol curve then diverges to more positive potentials as the alkalinity is increased.

Additional evidence on the effects of substitution in the indophenol nucleus is furnished by the present study. The following tabulation brings out certain interesting comparisons:

Comparison of the constants found in the simple indophenols and the indo 2,6-dichlorophenol series

	E_0	pK_0	pK_r	pK_2
Simple indophenols				
Substituent:				
Phenol	0.649	8.1	9.4	10.6
o-Chlorophenol	.663	7.0	8.4	10.3
o-Cresol	.616	8.4	9.5	10.9
1-Naphthol, 2-sulphonate	.544	8.68	9.10	10.70
Indo 2,6-dichlorophenols				
Substituent:				
Phenol	.668	5.7	7.00	10.13
o-Chlorophenol	.668	5.8	7.05	8.75
o-Cresol	.639	5.5	7.10	10.43
1-Naphthol, 2-sulphonate	.563	6.1	7.45	9.32

In this tabulation we may regard the values of E_0 as an approximate index of the relative position of the various systems to each other. It will be noted that the dichloro series is, in general, more positive than the simple indophenol series to the extent of about 10 to 20 millivolts. This was already pointed out in Paper V for the dibromo compounds. The introduction of a naphthol-sulphonic acid group in the molecule shifts each system 0.1 volt to the negative side of the phenol system. (See also Fig. 1.) In the simple indophenol series, the addition of a methyl group produces a system more negative by 0.033 v., and such a substitution in the dichloro series results in a system 0.029 v. more negative. Substitution of o-chlor in the simple indophenol produces a definite positive shift, but this is not apparent in the dichloro indophenol.

Most of the relative shifts in the acid dissociation constants as a result of substitution are different in direction and in magnitude in the two series. A certain uniformity may be pictured in each of the series, but no simple consistent theory seems to account for all of them. The differences found are of such a magnitude as hardly to be accounted for by an effect of possible impurities. The difficulty of interpretation incident to possible effects of tautomerism has already been discussed in the last paper.

A Selection of Indophenols as Oxidation-Reduction Indicators

The main reason for studying the indo 2,6-dichlorophenols and presenting the complete and detailed data lies in the fact that their characteristics make them useful as indicators of oxidation-reduction

intensity in biological systems within physiological ranges of hydrion concentration. This was predicted from the data presented in earlier papers from this laboratory. Certain qualitative observations on the utility of phenol indo 2,6-dibromophenol were reported in Paper VI, and these have been confirmed and amplified by other workers to whom samples of the indicator were furnished (Voegtlin, Johnson, and Dyer, 1924). The analogous 2,6-dichloro compound is more readily made in pure form and has the same desirable properties so that it should prove a useful substitute.

We have, to date, presented more or less complete data on 26 different indophenols. These represent different degrees of desirability as oxidation-reduction indicators. Some are poorly soluble, some are difficult or nearly impossible to purify, and some are relatively unstable. It seems desirable now to select from this list those indophenols that appear to be most suitable as oxidation-reduction indicators in physiological systems under certain restricted conditions that require brief discussion.

(1) *Hydrion concentration.*—The important controlling effect of pH on the oxidation-reduction equilibria of the indophenols has been repeatedly stressed. In Paper VI we have shown how the E'_0: pH curves of some of them cross and recross each other as the pH changes, so that now one system and now another becomes more positive—that is, *the pH must be specified and fairly rigidly maintained if relative oxidation-reduction intensities when measured are to have any significance.* For purposes of exposition, we have arbitrarily selected pH 7.0 as the hydrion concentration at which the various indophenols are to be compared. A similar system can be worked out for any other pH from our published data.

(2) *Color changes of the indophenols.*—These compounds show two kinds of color change. One is the ordinary acid-base indicator change—a rather pale reddish color in acid and an intense blue in alkaline ranges. The other is the oxidation-reduction change from the color of the oxidant (red or blue) to that of the reductant (practically colorless). This is the color change in which we are now interested. Electrometrically, this change can be measured from 0 to 100 per cent transformation, but *visually* only within a small range (near the zone of complete decolorization) can the degree of transformation be differentiated sufficiently well for colorimetric comparison. In solutions of a concentration around 0.001 molar, we have found the eye readily able to pick out color distinctions in the zone between 70 and 95 per cent reduction (decolorization). These limits may be extended somewhat by the use of colorimeters and of more dilute indicator solutions.

This imposes a rather heavy handicap, since more compounds will be required to cover a given range of reduction potential than would be necessary if visual perception of decoloration were more effective.

(3) *Stability of the indophenols.*—We have pointed out that these compounds are in some cases not very stable. In general, they should not be exposed to extremes of acidity or alkalinity, to elevated temperatures, or to unrestricted contact with air. Solutions of these compounds also appear to be rapidly affected by strong sunlight.

The table below gives a useful survey of the selected indophenols. The electrode potentials listed after each compound were calculated for pH 7.0 and are not applicable for any other hydrion concentration. The compounds marked with an asterisk (*) are least desirable, because of poor solubility or low stability, but they cover ranges not covered by other compounds.

Some selected indophenols: Electrode potentials at pH 7.0 at 50, 70, and 95 per cent reduction

Indophenol	E_h (at per cent reduction indicated)		
	50 per cent (E'_o)	70 per cent	95 per cent
1-Naphthol, 2-sulphonate indo 2, 6-dichlorophenol †	+0.1186	0.1075	0.0767
1-Naphthol, 2-sulphonate indophenol	+.1230	.1119	.0811
*Thymol indophenol and *carvacrol indophenol	+.1713	.1602	.1294
o-Cresol indo 2, 6-dichlorophenol	+.1806	.1695	.1387
o-Cresol indophenol	+.1947	.1836	.1528
*m-Cresol indophenol	+.2104	.1993	.1685
Phenol indo 2, 6-dichlorophenol † and the dibromo compound	+.2169	.2058	.1750
o-Chlorophenol indo 2, 6-dichlorophenol	+.2191	.2080	.1772
Phenol indophenol	+.2276	.2165	.1857
o-Bromo phenol indophenol	+.2306	.2195	.1887
o-Chlorophenol indophenol †	+.2333	.2222	.1914
*m-Bromophenol indophenol †	+.2475	.2364	.2056

† The percentage reduction curves of these compounds are shown in Figure 2.
* Of low stability or solubility.

In Figure 2 we have plotted the curves for five of the compounds, the curves being shaded in the zone 70–95 per cent reduction. The above table and the chart make clear the limitations to which we have alluded.

In biochemical application, one indophenol from each extreme of the limited potential scale may be used in preliminary work. If there then appears need for determining the potential more definitely, the other intermediate indophenols may be applied. It should be emphasized that we have left out of consideration a variety of factors (such as incidental presence of air, colloids, catalysts, etc.), that in any particular experiment might produce conditions of a peculiar nature and results that would have to be interpreted with caution. Our present discussion has dealt only with simple, general aspects of the use of the indophenols as indicators of oxidation-reduction.

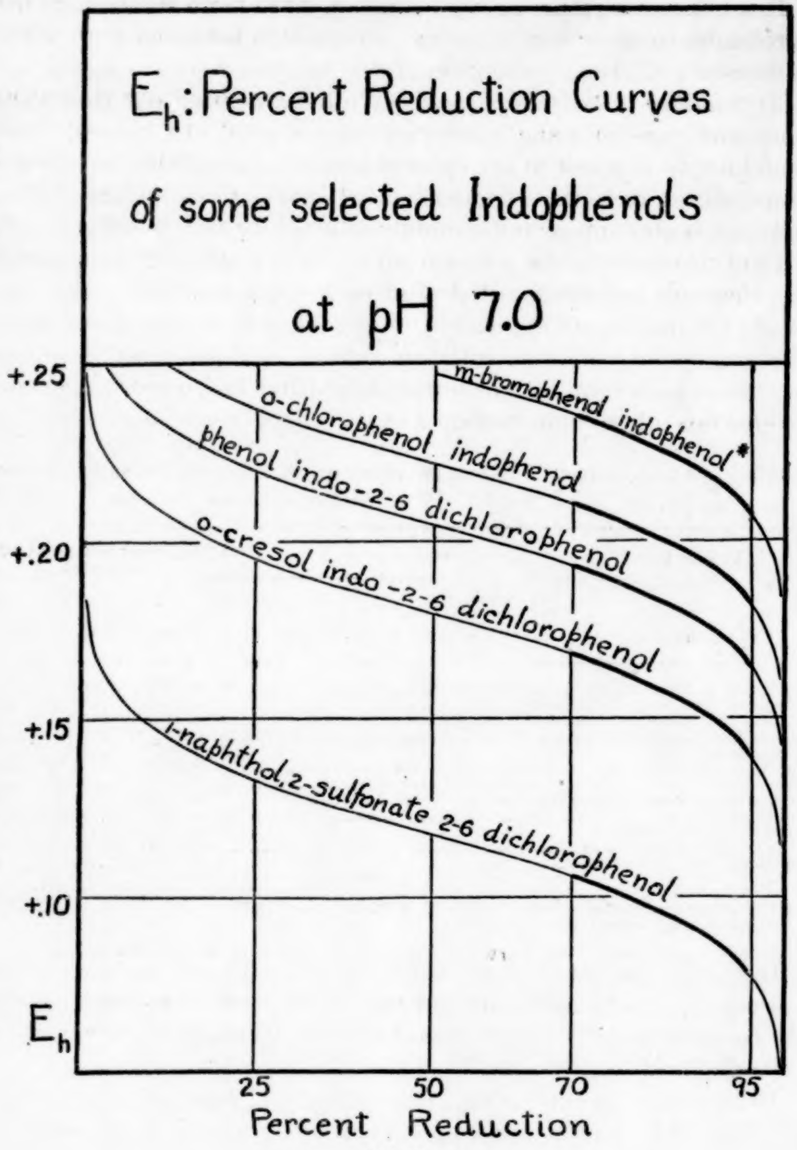


FIG. 2

Summary

Complete data are presented on the equilibrium potentials found with mixtures of oxidant and reductant of the following indophenols: phenol indo 2, 6-dichlorophenol; o-chlorophenol indo 2, 6-dichlorophenol; o-cresol indo 2, 6-dichlorophenol; and l-naphthol, 2-sulfonate indo 2, 6-dichlorophenol.

These compounds have been compared with substituted simple indophenols and found to show interesting analogies and differences.

The complete data on all indophenols reported from this laboratory have been reviewed, and a selection is presented of the compounds most likely to prove useful in measurement of oxidation-reduction potentials between approximately +0.07 and +0.24 volts at pH 7.0.

Acknowledgment.—We are indebted to Chemist E. Elvove and Assistant Chemist C. G. Remsburg of this Laboratory for most of the chemical analyses of our compounds.

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Table 1.—*Analyses (on moist basis) of the seven indophenols described in this paper*

	Compound and number						
	Phenol indo 2, 6-dichlorophenol (1)	Leuco phenol indo 2, 6-dichlorophenol (2)	o-Cresol indo 2, 6-dichlorophenol (3)	Leuco o-cresol indo 2, 6-dichlorophenol · H_2O (4)	Leuco m-cresol indo 2, 6-dichlorophenol (5)	o-Chlorophenol indo 2, 6-dichlorophenol (6)	1-Naphthol, 2-sulphonate indo 2, 6-dichlorophenol [2](7)
Moisture	11.10	0.0	7.36	[1] 6.20	0.0	17.03	11.28
Nitrogen	3.58	4.97 4.94	3.61	4.88	4.77 4.88	3.40	2.70
Chlorine	27.56	26.96 26.86	----------	23.83	24.39 24.57	27.97	----------
Sodium	12.09	0.0	12.44	0.0	0.0	6.89	10.71
NaCl (calculated)	16.03	0.0	17.11	0.0	0.0	3.14	5.20
Cl in organic combination (calculated)	17.86	26.96 26.86	----------	23.83	24.39 24.57	26.20	----------
Indophenol by calculation	72.95	100.0	75.50	100.0	100.0	79.82	83.52
Indophenol by $TiCl_3$ titration	79.6	----------	71.2	----------	----------	80.21	85.46

[1] Theory for $1H_2O$=5.96 %.
[2] Sulphur, 6.17%.

In the following comparisons of analysis and theoretical composition, the pure sodium salts of the indophenols are considered to be the residue after subtracting the moisture and the salt. The analyses justify these assumptions.

		1	2	3	4	5	6	7
N	Theory	4.83	5.18	4.60	4.63	4.93	4.32	3.15
	Found	4.91	4.96	4.78	4.88	4.83	4.26	3.23
Cl	Theory	24.48	26.29	----------	23.52	25.00	32.83	----------
	Found	24.48	26.91	----------	23.83	24.48	32.83	----------
S	Theory	----------	----------	----------	----------	----------	----------	7.21
	Found	----------	----------	----------	----------	----------	----------	7.39
Water	Theory	----------	----------	----------	(1)	----------	----------	----------
	Found	----------	----------	----------	(1)	----------	----------	----------

[1] Theory for 1 mol. H_2O, 5.96%; found, 6.20%.

Table 2.—*Phenol indo 2, 6–dichlorophenol: Relation of E'_0 to pH*

[E_0=0.6684; $K_0=2\times10^{-4}$; $K_1=1\times10^{-7}$; $K_2=7.4\times10^{-11}$]

Solution No.	pH	E'_0 calculated	E'_0 observed	Deviation
13	6.311	0.2701	0.2708	+0.0007
15	6.822	.2302	.2315	+.0013
16	7.411	.1878	.1880	+.0002
20	8.068	.1454	.1446	−.0008
22	8.635	.1108	.1108	.0000
23	9.251	.0748	.0741	−.0007
23½	9.601	.0555	.0557	+.0002
24	10.158	+.0281	+.0279	−.0002
25	11.102	−.0076	−.0069	+.0007
26	11.398	−.0172	−.0181	−.0009

Table 3.—*Phenol indo, 2, 6-dichlorophenol titrated with leuco indigo disulphonate at pH 8.628*

Indigo (c. c.)	Reduction (per cent)	0.03006 log $\frac{[S_r]}{[S_o]}$	E_h	E'_o	E'_o corrected (β)*	Deviation from 0.1112
1	4.83	−0.0389	+0.1500	+0.1111	+0.1112	0.0000
2	9.66	−.0292	.1402	.1110	.1112	.0000
3	14.49	−.0232	.1340	.1108	.1111	−.0001
4	19.32	−.0187	.1295	.1108	.1111	−.0001
5.02	24.25	−.0149	.1255	.1106	.1110	−.0002
6	28.98	−.0117	.1223	.1106	.1111	−.0001
7	33.82	−.0088	.1194	.1106	.1112	.0000
8	38.65	−.0060	.1166	.1106	.1112	.0000
9	43.48	−.0034	.1139	.1105	.1112	.0000
10	48.31	−.0009	.1113	.1104	.1112	.0000
11	53.14	+.0016	.1088	.1102	.1111	−.0001
12	57.97	.0042	.1060	.1102	.1112	.0000
13	62.80	.0068	.1033	.1101	.1111	−.0001
14	67.64	.0096	.1004	.1100	.1111	−.0001
15	72.47	.0126	.0974	.1100	.1112	.0000
16	77.30	.0160	.0940	.1100	.1112	.0000
17	82.13	.0199	.0899	.1098	.1112	.0000
18	86.96	.0248	.0849	.1097	.1111	−.0001
19	91.79	.0315	.0780	.1095	.1110	−.0002
20	96.62	.0439	.0660	.1099	.1115	+.0003
20.7	100.00					

* The (β) correction is a correction derived by a graphic method described in Paper VI.

Table 4.—*Leuco phenol indo 2, 6-dichlorophenol titrated with K_3FeCy_6 at pH 8.626*

K_3FeCy_6 (c. c.)	Oxidation (per cent)	0.03006 log $\frac{[S_r]}{[S_o]}$	E_h	E_h corrected (α)*	E'_o	Deviation from 0.1112
1	5.26	+0.0377	+0.0724	+0.0723	+0.1100	−0.0012
2	10.53	.0279	.0827	.0824	.1103	−.0009
3	15.79	.0218	.0894	.0890	.1108	−.0004
4	21.05	.0173	.0945	.0938	.1111	−.0001
5	26.32	.0134	.0985	.0977	.1111	−.0001
6	31.58	.0101	.1023	.1013	.1114	+.0002
7	36.84	.0070	.1055	.1043	.1113	+.0001
8	42.10	.0041	.1087	.1074	.1115	+.0003
9	47.37	+.0014	.1115	.1101	.1115	+.0003
10	52.63	−.0014	.1145	.1129	.1115	+.0003
11	57.90	−.0041	.1174	.1157	.1116	+.0004
12	63.16	−.0070	.1204	.1185	.1115	+.0003
13	68.43	−.0101	.1237	.1217	.1116	+.0004
14	73.69	−.0134	.1272	.1251	.1117	+.0005
15	78.95	−.0173	.1311	.1289	.1116	+.0004
16	84.21	−.0218	.1359	.1335	.1117	+.0005
17	89.47	−.0279	.1423	.1397	.1118	+.0006
18	94.74	−.0377	.1523	.1496	.1119	+.0007
19	100.00					

*The (α) correction (determined experimentally) adjusts for the acidity changes caused by the formation of HK_3FeCy_6 with increasing amounts of K_3FeCy_6. Application of the (β) correction, in addition, results in practically uniform E'_o values of 0.1112.

Table 5.—*o-Cresol indo 2, 6-dichlorophenol: Relation of E'_o to pH*

[E_o=0.6394; K_o=3.2×10^{-6}; K_r=8×10^{-9}; K_2=3.7×10^{-11}]

Solution No.	pH	E'_o calculated	E'_o observed	Deviation
12	5.752	0.2807	0.2782	(−0.0025)
13	6.311	.2356	.2354	−.0002
15	6.822	.1943	.1943	.0000
16	7.411	.1507	.1507	.0000
20	8.068	.1075	.1075	.0000
22	8.635	.0727	.0745	+.0018
23	9.251	.0360	.0364	+.0004
23½	9.601	+.0159	.0158	−.0001
24	10.158	−.0139	−.0140	−.0001
25	11.102	−.0535	−.0505	+.0030
26	11.398	−.0636	−.0632	+.0004

TABLE 6.—*o-Cresol indo 2, 6-dichlorophenol titrated with leuco indigo disulphonate at pH 8.628*

Indigo (c. c.)	Reduction (per cent)	$0.03006 \log \frac{[S_r]}{[S_o]}$	E_h	E'_o	Deviation from 0.0749
2	12.50	−0.0254	+0.1002	+0.0748	−0.0001
2.90	18.12	−.0197	.0948	.0751	+.0002
4	25.00	−.0143	.0894	.0751	+.0002
5	31.25	−.0103	.0851	.0748	−.0001
6	37.50	−.0067	.0816	.0749	.0000
7	43.75	−.0033	.0782	.0749	.0000
8	50.00	.0000	.0748	.0748	−.0001
9	56.25	+.0033	.0714	.0747	−.0002
10	62.50	.0067	.0680	.9747	−.0002
11	68.75	.0103	.0645	.0748	−.0001
12	75.00	.0143	.0605	.0748	−.0001
13	81.25	.0192	.0557	.0749	.0000
14	87.50	.0254	.0495	.0749	.0000
15	93.75	.0354	.0399	(.0753)	(+.0004)
16	100.00				

TABLE 7.—*o-Chlorophenol indo 2, 6-dichlorophenol: Relation of E'_o to pH*

[$E_o=0.6684$; $K_o=1.6\times10^{-6}$; $K_r=9\times10^{-9}$; $K_2=1.8\times10^{-8}$]

Solution No.	pH	E'_o calculated	E'_o observed	Deviation
12	5.681	(0.3202)	(.3181)	(−0.0021)
13	6.311	.2724	.2727	+.0003
15	6.822	.2326	.2325	−.0001
16	7.411	.1903	.1901	−.0002
20	8.068	.1494	.1496	+.0002
22	8.635	.1196	.1219	+.0023
23	9.251	.0936	.0941	+.0005
23½	9.601	.0813	.0811	−.0002
24	10.158	.0633	.0609	−.0024
25	11.102	(.0345)	(.0369)	(+.0024)
26	11.398	(.0256)	(.0247)	(−.0009)

TABLE 8.—*o-Chlorophenol indo 2, 6-dichlorophenol titrated with leuco indigo disulphonate at pH 8.628*

Indigo (c. c.)	Reduction (per cent)	$0.03006 \log \frac{[S_r]}{[S_o]}$	E_h	E'_o	Deviation from 0.1223
2	7.04	−0.0337	+0.1560	+0.1223	0.0000
3	10.56	−.0279	.1505	.1226	+.0003
4	14.08	−.0236	.1462	.1226	+.0003
5	17.60	−.0202	.1426	.1224	+.0001
6	21.13	−.0172	.1395	.1223	.0000
7	24.65	−.0146	.1369	.1223	.0000
8	28.17	−.0122	.1345	.1223	.0000
9	31.69	−.0100	.1323	.1223	.0000
10	35.21	−.0080	.1303	.1223	.0000
11	38.73	−.0060	.1283	.1223	.0000
12	42.25	−.0041	.1263	.1222	−.0001
13	45.78	−.0022	.1245	.1223	.0000
14	49.30	−.0004	.1227	.1223	.0000
15	52.82	+.0015	.1209	.1224	+.0001
16	56.34	.0033	.1192	.1225	+.0002
17	59.86	.0052	.1170	.1222	−.0001
18	63.38	.0072	.1151	.1223	.0000
19	66.90	.0092	.1131	.1223	.0000
20	70.42	.0113	.1109	.1222	−.0001
21	73.94	.0136	.1087	.1223	.0000
22	77.46	.0161	.1062	.1223	.0000
23	80.98	.0189	.1033	.1222	−.0001
24	84.50	.0221	.1002	.1223	.0000
25	88.03	.0261	.0962	.1223	.0000
26	91.55	.0311	.0914	.1225	+.0002
27	95.07	.0386	.0840	.1226	+.0003
28.4	100.00				

TABLE 9.—*1-Naphthol-2-sulphonate indo 2, 6-dichlorophenol: Relation of E'_o to pH*

[E_o=0.5630; $K_o=7.245\times10^{-7}$; $K_r=3.549\times10^{-8}$; $K_2=4.787\times10^{-10}$]

Solution No.	pH	E'_o calculated	E'_o observed	Deviation
9	5.044	0.2588	(0.2627)	(+0.0039)
12	5.752	.2130	.2133	+.0003
13	6.255	.1769	.1764	−.0005
15	6.822	.1327	.1314	−.0013
16	7.404	.0876	.0876	.0000
20	8.058	.0424	.0416	−.0008
22	8.633	+.0077	+.0086	+.0009
23	9.246	−.0242	−.0235	+.0007
24	10.144	−.0597	−.0595	+.0002
26	11.398	−.0991	(−.1063)	(−.0072)

TABLE 10.—*1-Naphthol-2-sulphonate indo 2, 6-dichlorophenol titrated with leuco indigo disulphonate at pH 8.628*

Indigo (c. c.)	Reduction (per cent)	$0.03006 \log \frac{[S_r]}{[S_o]}$	E_h	E_o'	Deviation from 0.0089
1	5.24	−0.0378	+0.0483	(+0.0105)	+0.0016
2	10.47	−.0280	.0373	.0093	+0.0004
3	15.71	−.0219	.0309	.0090	+.0001
4	20.94	−.0174	.0264	.0090	+.0001
5	26.18	−.0135	.0224	.0089	.0000
6	31.41	−.0102	.0191	.0089	.0000
7	36.65	−.0071	.0159	.0088	−.0001
8	41.89	−.0043	.0128	.0085	−.0004
9	47.12	−.0015	.0103	.0088	−.0001
10	52.36	+.0012	.0076	.0088	−.0001
11	57.60	.0040	.0051	.0091	+.0002
12	62.83	.0068	+.0024	.0092	+.0003
14	73.30	.0132	−.0040	.0092	+.0003
16	83.77	.0214	−.0125	.0089	.0000
18	94.24	.0365	−.0279	.0086	−.0003
19.1	100.00				

NEW YORK LAW REGARDING THE MAKING AND REPORTING OF SMALLPOX VACCINATIONS

A 1924 New York law (chapter 25) amends section 311 of chapter 45 of the consolidated laws. The section of the public health law amended relates to the making and reporting of smallpox vaccinations and, as amended, reads as follows:

SEC. 311. *Vaccination how made; reports.*—1. No person shall perform vaccination for the prevention of smallpox who is not a regularly licensed physician under the laws of the State. Vaccination shall be performed in such manner only as shall be prescribed by the State commissioner of health.

2. No physician shall use vaccine virus for the prevention of smallpox unless such vaccine virus is produced under license issued by the Secretary of the Treasury of the United States and is accompanied by a certificate of approval by the State commissioner of health, and such vaccine virus shall then be used only within the period of time specified in such approval.

3. Every physician performing a vaccination shall within 10 days make a report to the local health officer upon a form furnished by the State commissioner of health setting forth the full name and age of the person vaccinated and, if such person is a minor, the name and address of his parents, the date of vaccination, the date of previous successful vaccination if possible, the name of the

maker of the vaccine virus, the lot or batch number of such vaccine virus and whether upon re-examination after a proper interval such vaccination was found to be successful or nonsuccessful.

4. Every local health officer shall retain in the files and records of his office every report of a vaccination reported to him under the provisions of the preceding paragraph and shall report once in each month to the State department of health the number of vaccinations reported to him during the preceding month, together with the number of those which were successful and the number unsuccessful. Such report shall be made in such manner as shall be prescribed by the State commissioner of health.

DEATHS DURING WEEK ENDED MARCH 21, 1925

Summary of information received by telegraph from industrial insurance companies for week ended March 21, 1925, and corresponding week of 1924. (From the Weekly Health Index, March 24, 1925, issued by the Bureau of the Census, Department of Commerce.)

	Week ended Mar. 21, 1925	Corresponding week, 1924
Policies in force	59, 070, 177	55, 349, 359
Number of death claims	12, 743	11, 567
Death claims per 1,000 policies in force, annual rate	11. 2	10. 9

Deaths from all causes in certain large cities of the United States during the week ended March 21, 1925, infant mortality, annual death rate, and comparison with corresponding week of 1924. (From the Weekly Health Index, March 24, 1925, issued by the Bureau of the Census, Department of Commerce)

City	Week ended Mar. 21, 1925		Annual death rate per 1,000 corresponding week, 1924	Deaths under 1 year		Infant mortality rate week ended Mar. 21, 1925 [2]
	Total deaths	Death rate [1]		Week ended Mar. 21, 1925	Corresponding week, 1924	
Total (64 cities)	7, 866	14. 9	[3] 14. 5	961	[3] 946	
Akron	51			9	2	99
Albany [4]	55	24. 0	15. 0	1	1	22
Atlanta	66	14. 8	24. 3	6	9	
Baltimore [4]	308	20. 2	15. 4	33	26	96
Birmingham	82	20. 8	20. 5	7	13	
Boston	265	17. 6	15. 2	36	29	95
Bridgeport	36			1	2	16
Buffalo	167	15. 7	13. 6	28	21	114
Cambridge	22	10. 2	14. 0	1	6	17
Camden	40	16. 2	12. 4	4	2	66
Chicago [4]	819	14. 3	12. 8	107	81	95
Cincinnati	162	20. 6	16. 4	21	12	124
Cleveland	218	12. 1	11. 7	37	26	92
Columbus	92	17. 5	15. 9	9	12	85
Dallas	32	8. 6	15. 3	4	8	
Dayton	53	16. 0	10. 5	5	3	80
Denver	79			8	9	
Des Moines	34	11. 9	12. 2	3	8	51
Detroit	331			58	47	98
Duluth	25	11. 8	9. 1	1	0	21
Erie	28			3	5	59
Fall River [4]	37	15. 9	19. 8	11	11	158
Flint	17			4	4	66
Fort Worth	25	8. 6	8. 8	2	1	
Grand Rapids	35	12. 1	10. 9	5	6	78

[1] Annual rate per 1,000 population.
[2] Deaths under 1 year per 1,000 births—an annual rate based on death under 1 year for the week and estimated births for 1924. Cities left blank are not in the registration area for births.
[3] Data for 63 cities.
[4] Deaths for week ended Friday, Mar. 20, 1925.

Deaths from all causes in certain large cities of the United States during the week ended March 21, 1925, infant mortality, annual death rate, and comparison with corresponding week of 1924. (From the Weekly Health Index, March 24, 1925, issued by the Bureau of the Census, Department of Commerce)—Continued

City	Week ended Mar. 21, 1925		Annual death rate per 1,000 corresponding week, 1924	Deaths under 1 year		Infant mortality rate week ended Mar. 21, 1925
	Total deaths	Death rate		Week ended Mar. 21, 1925	Corresponding week, 1924	
Houston	46			1	3	
Indianapolis	114	16.6	19.9	10	18	69
Jacksonville, Fla	41	20.4	20.4	7	3	156
Jersey City	84	13.9	16.0	12	17	84
Kansas City, Kans	38	16.0	16.3	8	4	169
Kansas City, Mo	149	21.1	17.8	23	17	
Los Angeles	258			23	25	64
Louisville	104	20.9	18.2	13	11	114
Lowell	40	17.9	17.1	9	8	156
Lynn	25	12.5	11.6	2	3	53
Memphis	84	25.1	16.3	8	6	
Milwaukee	133	13.8	9.9	30	14	137
Minneapolis	127	15.6	12.6	18	13	96
Nashville [4]	30	12.6	24.5	1	6	
New Bedford	23	8.9	13.0	6	8	100
New Haven	57	16.6	14.5	5	6	65
New Orleans	146	18.4	19.2	15	6	
New York	1,581	13.5	13.7	204	222	81
Bronx Borough	179	10.3	11.7	15	19	52
Brooklyn Borough	527	12.3	12.9	59	76	62
Manhattan Borough	693	16.0	15.7	108	105	108
Queens Borough	143	13.0	10.6	20	17	90
Richmond Borough	39	15.2	16.4	2	5	36
Newark, N. J	132	15.2	12.9	16	14	73
Norfolk	34	10.5	7.6	6	2	107
Oakland	55	11.3	10.8	3	7	35
Oklahoma City	30	14.6	12.0	4	1	
Omaha	69	17.0	13.8	5	9	48
Paterson	31	11.4	14.1	7	6	117
Philadelphia	535	14.1	15.1	66	74	83
Pittsburgh	268	22.1	23.4	32	42	112
Portland, Oreg	70	12.9	12.4	5	8	52
Providence	61	13.0	17.5	10	10	80
Richmond	39	10.9	15.0	2	5	24
Rochester	80	12.6		9		71
St. Louis	246	15.6	16.4	13	15	
St. Paul	71	15.0	13.7	6	11	51
Salt Lake City [4]	34	13.5	18.7	3	3	47
San Antonio	57	15.0	19.6	9	15	
San Francisco	154	14.4	14.5	9	8	52
Schenectady	21	10.7	11.4	5	3	141
Seattle	67			4	7	41
Somerville	21	10.7	11.4	2	2	54
Spokane	26			2	0	44
Springfield, Mass	49	16.7	9.8	5	5	74
Syracuse	60	16.3	8.0	3	3	38
Tacoma	22	11.0	13.2	0	5	0
Toledo	73	13.2	12.6	9	9	81
Trenton	34	13.4	16.1	5	10	81
Washington, D. C	150	15.7	17.1	11	21	62
Waterbury	28			5	1	111
Wilmington, Del	33	14.1	12.2	3	2	68
Worcester	53	13.9	13.1	7	6	81
Yonkers	32	14.9	9.5	7	4	154
Youngstown	39	12.7	15.8	7	9	89

[4] Deaths for week ended Friday, Mar. 20, 1925.

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

CURRENT WEEKLY STATE REPORTS

These reports are preliminary, and the figures are subject to change when later returns are received by the State health officers

Reports for Week Ended March 28, 1925

ALABAMA

	Cases
Cerebrospinal meningitis	3
Chicken pox	59
Diphtheria	21
Dysentery	2
Influenza	552
Malaria	24
Measles	59
Mumps	39
Ophthalmia neonatorum	2
Pellagra	15
Pneumonia	207
Poliomyelitis	2
Scarlet fever	28
Smallpox	180
Tetanus	5
Tuberculosis	101
Typhoid fever	25
Whooping cough	10

ARIZONA

	Cases
Chicken pox	20
Diphtheria	2
Measles	28
Pneumonia	1
Scarlet fever	10
Tuberculosis	2
Typhoid fever	1
Whooping cough	1

ARKANSAS

	Cases
Chicken pox	23
Diphtheria	7
Hookworm disease	2
Influenza	342
Malaria	32
Measles	28

ARKANSAS—continued

	Cases
Mumps	24
Pellagra	13
Scarlet fever	4
Smallpox	2
Trachoma	1
Tuberculosis	18
Typhoid fever	2
Whooping cough	15

CALIFORNIA

	Cases
Cerebrospinal meningitis:	
Fresno	1
Los Angeles	1
Los Angeles County	1
Diphtheria	128
Influenza	149
Measles	103
Poliomyelitis:	
Alameda	1
Berkeley	2
Oakland	1
Lethargic encephalitis:	
Bakersfield	1
San Francisco	1
Rocky Mountain spotted fever—Lassen County	1
Scarlet fever	172
Smallpox:	
Grass Valley	25
Los Angeles	34
Los Angeles County	17
Oakland	13
San Diego	28
San Francisco	9
Scattering	44
Typhoid fever	9

COLORADO

(Exclusive of Denver)	Cases
Chicken pox	8
Diphtheria	5
Influenza	21
Mumps	2
Pneumonia	10
Scarlet fever	16
Tuberculosis	24

CONNECTICUT

Chicken pox	80
Conjunctivitis (infectious)	1
Diphtheria	38
German measles	42
Influenza	16
Lethargic encephalitis	3
Measles	173
Mumps	98
Paratyphoid fever	1
Pneumonia (all forms)	100
Scarlet fever	135
Septic sore throat	6
Trachoma	1
Tuberculosis (all forms)	23
Typhoid fever	1
Whooping cough	81

DELAWARE

Diphtheria	4
Influenza	9
Malaria	4
Measles	3
Mumps	4
Pneumonia	7
Scarlet fever	3
Tuberculosis	2

FLORIDA

Chicken pox	11
Diphtheria	18
Influenza	4
Lethargic encephalitis	1
Malaria	18
Measles	7
Mumps	62
Pneumonia	1
Scarlet fever	3
Smallpox	13
Tuberculosis	16
Typhoid fever	6
Whooping cough	11

GEORGIA

Chicken pox	56
Conjunctivitis (infectious)	2
Diphtheria	12
Dysentery	2
Hookworm disease	3
Influenza	784
Malaria	28
Measles	15
Mumps	116
Pellagra	6
Pneumonia	89
Scarlet fever	2
Septic sore throat	9

GEORGIA—continued	Cases
Smallpox	8
Tuberculosis	18
Typhoid fever	11
Whooping cough	37

ILLINOIS

Cerebrospinal meningitis:	
Cook County	1
La Salle County	1
Peoria County	1
Diphtheria:	
Cook County	71
Scattering	36
Influenza	155
Lethargic encephalitis:	
Henderson County	1
Macoupin County	1
Williamson County	1
Measles	1,225
Pneumonia	398
Scarlet fever:	
Cook County	350
Kane County	13
Kankakee County	13
Knox County	10
St. Clair County	10
Sangamon County	22
Scattering	113
Smallpox:	
Ogle County	8
Shelby County	13
Scattering	41
Tuberculosis	398
Typhoid fever	26
Whooping cough	264

INDIANA

Chicken pox	54
Diphtheria	23
Influenza	164
Measles	122
Mumps	8
Ophthalmia neonatorum	4
Pneumonia	23
Scarlet fever:	
Allen County	8
Cass County	8
Clark County	9
Clay County	10
Elkhart County	17
Fulton County	20
Huntington County	20
La Porte County	11
Marshall County	13
Parke County	11
Starke County	11
St. Joseph County	27
Vanderburgh County	17
Vigo County	10
Scattering	76
Smallpox:	
Carroll County	15
Marion County	25
Scattering	61
Tuberculosis	39
Typhoid fever	5
Whooping cough	32

IOWA

	Cases
Diphtheria	7
Scarlet fever	37
Smallpox	12

KANSAS

Cerebrospinal meningitis	3
Chicken pox	96
Diphtheria	24
German measles	2
Influenza	106
Measles	8
Mumps	523
Pellagra	1
Pneumonia	59
Scarlet fever	101
Septic sore throat	1
Smallpox	12
Trachoma	2
Tuberculosis	78
Whooping cough	24

LOUISIANA

Anthrax	1
Diphtheria	16
Hookworm disease	12
Influenza	113
Leprosy	1
Lethargic encephalitis	1
Malaria	11
Pellagra	6
Pneumonia	25
Scarlet fever	12
Smallpox	49
Tuberculosis	34
Typhoid fever	14

MAINE

Chicken pox	31
Diphtheria	4
Dysentery	2
German measles	2
Influenza	260
Measles	8
Mumps	73
Pneumonia	18
Scarlet fever	50
Septic sore throat	6
Tuberculosis	1
Typhoid fever	2
Vincent's angina	3
Whooping cough	3

MARYLAND [1]

Cerebrospinal meningitis	1
Chicken pox	83
Diphtheria	31
Dysentery	2
German measles	2
Influenza	57
Lethargic encephalitis	1
Measles	32
Mumps	74
Pneumonia (all forms)	144
Scarlet fever	70
Septic sore throat	4

[1] Week ended Friday.

MARYLAND—continued

	Cases
Smallpox	1
Tuberculosis	59
Typhoid fever	10
Whooping cough	109

MASSACHUSETTS

Cerebrospinal meningitis	5
Chicken pox	143
Conjunctivitis (suppurative)	15
Diphtheria	76
German measles	255
Influenza	72
Measles	675
Mumps	52
Ophthalmia neonatorum	33
Pneumonia (lobar)	177
Poliomyelitis	3
Scarlet fever	355
Septic sore throat	1
Tetanus	2
Trachoma	3
Trichinosis	1
Tuberculosis (all forms)	175
Typhoid fever	16
Whooping cough	168

MICHIGAN

Diphtheria	101
Measles	190
Pneumonia	193
Scarlet fever	413
Smallpox	20
Tuberculosis	55
Typhoid fever	7
Whooping cough	106

MINNESOTA

Cerebrospinal meningitis	1
Chicken pox	142
Diphtheria	74
Influenza	2
Lethargic encephalitis	2
Measles	36
Pneumonia	8
Poliomyelitis	3
Scarlet fever	262
Smallpox	19
Tuberculosis	94
Typhoid fever	3
Whooping cough	14

MISSISSIPPI

Diphtheria	15
Influenza	135
Scarlet fever	2
Smallpox	31
Typhoid fever	9

MISSOURI

Cerebrospinal meningitis	1
Chicken pox	64
Diphtheria	70
Influenza	41
Measles	15
Mumps	40

MISSOURI—continued

	Cases
Pneumonia	53
Poliomyelitis	1
Rabies	1
Scarlet fever	174
Smallpox	11
Trachoma	3
Tuberculosis	63
Typhoid fever	5
Whooping cough	25

MONTANA

Chicken pox	6
Diphtheria	9
German measles	78
Influenza	1
Measles	26
Mumps	37
Scarlet fever	32
Smallpox	9
Tuberculosis	10
Whooping cough	4

NEBRASKA

Chicken pox	12
Diphtheria	2
Influenza	49
Measles	8
Mumps	7
Scarlet fever	24
Smallpox	4
Whooping cough	3

NEW JERSEY

Anthrax	1
Cerebrospinal meningitis	1
Chicken pox	145
Diphtheria	89
Influenza	39
Measles	295
Pneumonia	167
Poliomyelitis	2
Scarlet fever	344
Smallpox	8
Trachoma	1
Trichinosis	1
Typhoid fever	7
Whooping cough	295

NEW MEXICO

Chicken pox	30
Diphtheria	4
Influenza	25
Measles	35
Mumps	36
Pneumonia	7
Scarlet fever	19
Tuberculosis	33
Typhoid fever	1
Whooping cough	10

NEW YORK

(Exclusive of New York City)

Cerebrospinal meningitis	1
Diphtheria	106
Influenza	243
Lethargic encephalitis	3

[1] Deaths.

NEW YORK—continued

	Cases
Measles	531
Pneumonia	466
Scarlet fever	409
Smallpox	3
Typhoid fever	13
Whooping cough	279

NORTH CAROLINA

Cerebrospinal meningitis	2
Chicken pox	174
Diphtheria	22
German measles	3
Measles	24
Scarlet fever	22
Smallpox	61
Typhoid fever	7
Whooping cough	116

OKLAHOMA

(Exclusive of Oklahoma City and Tulsa)

Cerebrospinal meningitis:	
McClain County	1
McCurtain County	1
Chicken pox	16
Diphtheria	17
Influenza	245
Measles	23
Mumps	16
Pneumonia	75
Scarlet fever	25
Smallpox:	
Custer County	8
Johnston County	9
Scattering	12
Typhoid fever	8
Whooping cough	17

OREGON

Chicken pox	27
Diphtheria:	
Portland	12
Scattering	12
Influenza	153
Lethargic encephalitis	[1] 2
Measles	4
Mumps	41
Pneumonia	22
Scarlet fever	15
Smallpox:	
Portland	12
Scattering	15
Tuberculosis	15
Typhoid fever	3
Whooping cough	14

SOUTH DAKOTA

Chicken pox	11
Diphtheria	2
Measles	1
Mumps	2
Pneumonia	5
Scarlet fever	32
Smallpox	5
Trachoma	1
Typhoid fever	1
Whooping cough	2

TEXAS

	Cases
Chicken pox	68
Diphtheria	21
Influenza	21
Measles	86
Mumps	109
Pneumonia	8
Scarlet fever	20
Smallpox	26
Trachoma	4
Tuberculosis	19
Typhoid fever	1
Whooping cough	10

VERMONT

Chicken pox	32
Diphtheria	1
Measles	14
Mumps	86
Pneumonia	4
Scarlet fever	18
Typhoid fever	1
Whooping cough	38

WASHINGTON

Chicken pox	92
Diphtheria	9
German measles	3
Measles	9
Mumps	89
Pneumonia	5
Scarlet fever	23
Smallpox	51
Tuberculosis	62
Typhoid fever	2
Whooping cough	66

WEST VIRGINIA

Cerebrospinal meningitis—Wheeling	1
Diphtheria	7
Scarlet fever	14

WEST VIRGINIA—continued

	Cases
Smallpox	8
Typhoid fever	4

WISCONSIN

	Cases
Milwaukee:	
Chicken pox	41
Diphtheria	16
German measles	638
Influenza	3
Measles	314
Mumps	29
Ophthalmia neonatorum	1
Pneumonia	16
Scarlet fever	24
Smallpox	9
Trachoma	1
Tuberculosis	17
Whooping cough	21
Scattering:	
Chicken pox	109
Diphtheria	47
German measles	76
Influenza	67
Measles	202
Mumps	338
Pneumonia	36
Scarlet fever	122
Smallpox	36
Trachoma	1
Tuberculosis	17
Typhoid fever	1
Whooping cough	64

WYOMING

Chicken pox	11
Measles	7
Mumps	14
Scarlet fever	7
Typhoid fever	6
Whooping cough	10

SUMMARY OF MONTHLY REPORTS FROM STATES

The following summary of monthly State reports is published weekly and covers only those States from which reports are received during the current week:

State	Cerebrospinal meningitis	Diphtheria	Influenza	Malaria	Measles	Pellagra	Poliomyelitis	Scarlet fever	Smallpox	Typhoid fever
February, 1925										
Delaware		10	14		2			30		6
Illinois	9	457	149	18	2,664	1	9	2,099	298	71
Kansas	5	191	86	0	32	0	0	468	30	11
Maine	1	23	35	0	19	0	0	75	0	12
Mississippi	1	57	19,368	2,681	417	299	4	30	244	126
Montana	1	32	5		107		2	122	62	7
North Carolina	2	140			96		2	124	329	4
North Dakota	1	64			4		2	236	15	6
Pennsylvania	7	930		1	3,195		2	2,878	25	69
South Carolina	1	235	245	1	4	1		7	79	7
South Dakota		25			6		1	188	40	7
Virginia	10	152	7,986	62	507	7	4	195	22	27
Wyoming		12	2		8			30	5	8

PLAGUE-ERADICATIVE MEASURES IN THE UNITED STATES

The following items were taken from the reports of plague-eradicative measures from the cities named for the week ended March 14, 1925:

Los Angeles, Calif.

Week ended March 14, 1925:	
Number of rats examined	3, 903
Number of rats found to be plague infected	24
Number of squirrels examined	807
Number of squirrels found to be plague infected	0
Totals to March 14, 1925:	
Number of rats examined	63, 718
Number of rats found to be plague infected	150
Number of squirrels examined	4, 677
Number of squirrels found to be plague infected	3

Oakland, Calif.

(Including other East Bay communities)

Week ended March 14, 1925:	
Number of rats examined	2, 968
Number of rats found to be plague infected	0
Totals to March 14, 1925:	
Number of rats examined	23, 789
Number of rats found to be plague infected	21

New Orleans, La.

Week ended March 14, 1925:	
Number of vessels inspected	355
Number of inspections made	988
Number of vessels fumigated with cyanide gas	37
Number of rodents examined for plague	4, 695
Number of rodents found to be plague infected	0
Totals to March 14, 1925:	
Number of rodents examined for plague	55, 718
Number of rodents found to be plague infected	12

GENERAL CURRENT SUMMARY AND WEEKLY REPORTS FROM CITIES

Diphtheria.—For the week ended March 14, 1925, 35 States reported 1,488 cases of diphtheria. For the week ended March 15, 1924, the same States reported 1,863 cases of this disease. One hundred cities, situated in all parts of the country and having an aggregate population of more than 28,700,000, reported 900 cases of diphtheria for the week ended March 14, 1925. Last year for the corresponding week they reported 1,035 cases. The estimated expectancy for these cities was 1,008 cases.

Measles.—Twenty-eight States reported 4,051 cases of measles for the week ended March 14, 1925, and 19,333 cases of this disease

for the week ended March 15, 1924. One hundred cities reported 2,478 cases of measles for the week this year, and 6,749 cases last year.

Scarlet fever.—Scarlet fever was reported for the week as follows: Thirty-five States, this year, 4,391 cases; last year, 4,444 cases; 100 cities—this year, 2,355 cases; last year, 1,918 cases; estimated expectancy, 1,054 cases.

Smallpox.—For the week ended March 14, 1925, 35 States reported 871 cases of smallpox. Last year for the corresponding week they reported 1,331 cases. One hundred cities reported smallpox for the week as follows: 1925, 309 cases; 1924, 498 cases; estimated expectancy, 101 cases. These cities reported 7 deaths from smallpox for the week this year: 4 in Minneapolis, Minn.; 2 in Milwaukee, Wis.; and 1 in Los Angeles, Calif.

Typhoid fever.—Two hundred and six cases of typhoid fever were reported for the week ended March 14, 1925, by 34 States. For the corresponding week of 1924 the same States reported 155 cases. One hundred cities reported 46 cases of typhoid fever for the week this year and 55 cases for the corresponding week last year. The estimated expectancy for these cities was 36 cases.

Influenza and pneumonia.—Deaths from influenza and pneumonia (combined) were reported for the week by 100 cities as follows: 1925, 1,366 deaths; 1924, 1,274 deaths.

City reports for week ended March 14, 1925

The "estimated expectancy" given for diphtheria, poliomyelitis, scarlet fever, smallpox, and typhoid fever is the result of an attempt to ascertain from previous occurrence how many cases of the disease under consideration may be expected to occur during a certain week in the absence of epidemics. It is based on reports to the Public Health Service during the past nine years. It is in most instances the median number of cases reported in the corresponding week of the preceding years. When the reports include several epidemics, or when for other reasons the median is unsatisfactory, the epidemic periods are excluded and the estimated expectancy is the mean number of cases reported for the week during nonepidemic years.

If reports have not been received for the full nine years, data are used for as many years as possible, but no year earlier than 1915 is included. In obtaining the estimated expectancy, the figures are smoothed when necessary to avoid abrupt deviations from the usual trend. For some of the diseases given in the table the available data were not sufficient to make it practicable to compute the estimated expectancy.

Division, State, and city	Population July 1, 1923, estimated	Chicken pox, cases reported	Diphtheria		Influenza		Measles, cases reported	Mumps, cases reported	Pneumonia, deaths reported
			Cases, estimated expectancy	Cases reported	Cases reported	Deaths reported			
NEW ENGLAND									
Maine:									
Portland	73,129	5	2	1	0	0	0	49	5
New Hampshire:									
Concord	22,408	0	0	0	0	0	0	0	1
Manchester	81,383	0	2	0	....	2	2	0	6
Vermont:									
Barre	[1] 10,008	6	0	0	0	0	0	11	1
Burlington	23,613	2	0	0	0	0	12	18	2

[1] Population Jan. 1, 1920.

City reports for week ended March 14, 1925—Continued

Division, State, and city	Population July 1, 1923, estimated	Chicken pox, cases reported	Diphtheria		Influenza		Measles, cases reported	Mumps, cases reported	Pneumonia, deaths reported
			Cases, estimated expectancy	Cases reported	Cases reported	Deaths reported			
NEW ENGLAND—contd.									
Massachusetts:									
Boston	770,400	31	62	39	30	7	147	9	27
Fall River	120,912	3	5	0	11	3	1	0	4
Springfield	144,227	3	4	3	1	1	48	5	3
Worcester	191,927	29	4	4	4	0	4	0	13
Rhode Island:									
Pawtucket	68,799	5	1	0	0	0	0	0	4
Providence	242,378	0	11	7	3	1	1	0	14
Connecticut:									
Bridgeport	[1] 143,555	0	8	7	2	1	1	0	5
Hartford	[1] 138,036	12	8	9	1	1	0	2	13
New Haven	172,967	14	3	1	4	0	16	1	2
MIDDLE ATLANTIC									
New York:									
Buffalo	536,718	11	17	4	1	1	131	7	16
New York	5,927,625	231	227	232	74	25	77	47	207
Rochester	317,867	1	7	17	0	0	30	25	5
Syracuse	184,511	1	6	6	7	2	2	10	8
New Jersey:									
Camden	124,157	5	4	2	0	0	29	0	3
Newark	438,699	25	18	7	19	0	43	16	17
Trenton	127,390	2	5	4	--------	4	24	0	5
Pennsylvania:									
Philadelphia	1,922,788	75	77	137	--------	10	345	34	78
Pittsburgh	613,442	108	22	12	--------	5	317	19	84
Reading	110,917	19	3	2	0	0	25	8	0
Scranton	140,636	0	4	3	0	0	2	0	11
EAST NORTH CENTRAL									
Ohio:									
Cincinnati	406,312	21	10	8	--------	3	2	10	13
Cleveland	888,519	113	28	32	--------	3	4	21	45
Columbus	261,082	7	4	1	--------	14	1	1	10
Toledo	268,338	12	5	10	0	0	27	0	15
Indiana:									
Fort Wayne	93,573	9	3	1	0	0	0	0	3
Indianapolis	342,718	0	10	0	--------	2	0	5	28
South Bend	76,709	3	1	4	0	0	5	0	4
Terre Haute	68,939	4	1	0	--------	3	0	0	5
Illinois:									
Chicago	2,866,121	113	113	62	67	17	479	28	132
Cicero	55,968	8	1	0	0	0	1	1	0
Peoria	79,675	11	1	0	0	0	0	2	7
Springfield	61,833	5	1	2	2	0	2	63	3
Michigan:									
Detroit	995,668	44	57	37	6	1	12	11	50
Flint	117,968	11	6	3	0	0	1	0	0
Grand Rapids	145,947	13	3	2	--------	2	29	0	2
Wisconsin:									
Madison	42,519	5	1	0	0	0	7	157	1
Milwaukee	484,595	47	15	18	1	0	426	139	28
Racine	64,393	14	1	2	0	0	29	7	0
Superior	[1] 39,671	5	1	0	0	0	0	0	1
WEST NORTH CENTRAL									
Minnesota:									
Duluth	106,289	8	1	0	0	0	0	0	5
Minneapolis	409,125	74	15	21	--------	1	8	7	17
St. Paul	241,891	20	12	17	0	0	18	25	11
Iowa:									
Davenport	61,262	0	1	1	0	--------	3	0	--------
Des Moines	140,923	1	3	0	0	--------	0	0	--------
Sioux City	79,662	9	2	1	0	--------	0	26	--------
Waterloo	39,667	9	0	0	0	--------	0	--------	--------
Missouri:									
Kansas City	351,819	19	9	8	18	12	2	25	27
St. Joseph	78,232	4	2	2	0	0	0	0	4
St. Louis	803,853	26	42	36	3	2	6	11	--------

[1] Population Jan. 1, 1920.

City reports for week ended March 14, 1925—Continued

Division, State, and city	Population July 1, 1923, estimated	Chicken pox, cases reported	Diphtheria: Cases, estimated expectancy	Diphtheria: Cases reported	Influenza: Cases reported	Influenza: Deaths reported	Measles, cases reported	Mumps, cases reported	Pneumonia, deaths reported
WEST NORTH CENTRAL—continued									
North Dakota:									
Fargo	24,841	1	1	0	0	0	0	12	1
Grand Forks	14,547	2	0	0	0		0	0	
South Dakota:									
Aberdeen	15,829	0		0	0		0	0	
Sioux Falls	29,206	0	2	0	0	0	0	0	0
Nebraska:									
Lincoln	58,761	27	2	1	0	0	2	0	1
Omaha	204,382	9	4	3	0	0	0	0	10
Kansas:									
Topeka	52,555	6	1	1	0	0	0	145	3
Wichita	79,261	26	1	8	0	0	2	2	2
SOUTH ATLANTIC									
Delaware:									
Wilmington	117,728	5	2	1	0	0	4	0	5
Maryland:									
Baltimore	773,580	72	24	19	26	2	10	32	39
Cumberland	32,361		1	3	1	0	0		1
Frederick	11,301		0	0	0	0	1		0
District of Columbia:									
Washington	[1] 437,571	20	11	7	2	2	22		16
Virginia:									
Lynchburg	30,277	1	0	0	0	0	0	44	3
Norfolk	159,089	25	1	1	0	0	8	77	6
Richmond	181,044	5	2	4		1	3	8	3
Roanoke	55,502	6	1	0	0	0	3	1	2
West Virginia:									
Charleston	45,597	3	1	0	0	0	9	0	3
Huntington	57,918	2	0	0	0		0	0	
Wheeling	[1] 56,208	5	2	1		1	0	3	9
North Carolina:									
Raleigh	29,171	5	0	0	0	0	7	0	2
Wilmington	35,719	0	1	0	0	0	0	4	1
Winston-Salem	56,230	7	1	2		2	5	3	1
South Carolina:									
Charleston	71,245	0	1	1		3	0	0	4
Columbia	39,688	2	1	0	0	0	0	2	2
Greenville	25,789	0	0	1	0	0	0	0	2
Georgia:									
Atlanta	222,963	1	2	4	10	2	0	0	12
Brunswick	15,937		0	0	0	0	0		0
Savannah	89,448	0	1	1	23	1	0	17	5
Florida:									
St. Petersburg	24,403	0	0	0	0	0	0	0	0
Tampa	56,050		2						
EAST SOUTH CENTRAL									
Kentucky:									
Covington	57,877	1	1	0	3	0	0	2	3
Lexington	43,673	1	0	2	0	0	0	0	2
Louisville	257,671	1	5	3	10	0	0	0	23
Tennessee:									
Memphis	170,067		6	0		1	1		14
Nashville	121,128		1			5			5
Alabama:									
Birmingham	195,901	9	2	2	6	7	0	3	11
Mobile	63,858	0	0	0		3	0	5	8
Montgomery	45,383	1	1	1	1	0	0	11	0
WEST SOUTH CENTRAL									
Arkansas:									
Fort Smith	30,635	1	1	1	0		7	0	
Little Rock	70,916	0	1	0	15	2	9	0	3
Louisiana:									
New Orleans	404,575	14	12	24	23	14	0	1	10
Shreveport	54,590	1		1	0	0	0	0	4

[1] Population Jan. 1, 1920

City reports for week ended March 14, 1925—Continued

Division, State, and city	Population July 1, 1923, estimated	Chicken pox, cases reported	Diphtheria		Influenza		Measles, cases reported	Mumps, cases reported	Pneumonia, deaths reported
			Cases, estimated expectancy	Cases reported	Cases reported	Deaths reported			
WEST SOUTH CENTRAL—continued									
Oklahoma:									
Oklahoma	101,150	0	1	0	10	2	0	0	6
Texas:									
Dallas	177,274	25	4	7	12	3	1	3	9
Galveston	46,877	6	1	0	0	0	0	4	1
Houston	154,970	4	2	0		2	0	2	3
San Antonio	184,727	0	3	1	0	0	2	0	5
MOUNTAIN									
Montana:									
Billings	16,927	5	0	0		1	3	13	2
Great Falls	27,787	1	1	3	0	0	68	0	0
Helena	[1] 12,037	0	0	0	0	0	0	0	0
Missoula	[1] 12,668	0	0	1	0	0	5	0	0
Idaho:									
Boise	22,806	0	0	0	0	0	0	0	0
Colorado:									
Denver	272,031	13	8	6		1	2	110	14
Pueblo	43,519	11	2	0	0	0	0	0	1
New Mexico:									
Albuquerque	16,648	1	1	0	0	0	0	0	0
Arizona:									
Phoenix	33,899	0		0		5	0	3	4
Utah:									
Salt Lake City	126,241	19	2	1		3	2	31	4
Nevada:									
Reno	12,429	0	0	0	0	0	0	0	1
PACIFIC									
Washington:									
Seattle	[1] 315,685	67	5	9	0		6	102	
Spokane	104,573	10	3	17	0		1	0	
Tacoma	101,731	1	1	1	0	0	0	2	0
Oregon:									
Portland	273,621	22	4	11	2	0	4	14	10
California:									
Los Angeles	666,853	78	35	28	48	1	20	42	30
Sacramento	69,950		1	1	0	0	0		1
San Francisco	539,038	31	26	12	4	3	11	51	7

Division, State, and city	Scarlet fever		Smallpox			Tuberculosis, deaths reported	Typhoid fever			Whooping cough, cases reported	Deaths, all causes
	Cases, estimated expectancy	Cases reported	Cases, estimated expectancy	Cases reported	Deaths reported		Cases, estimated expectancy	Cases reported	Deaths reported		
NEW ENGLAND											
Maine:											
Portland	1	6	0	0	0	2	1	0	1	0	22
New Hampshire:											
Concord	0	4	0	0	0	0	0	0	0	0	4
Manchester	2	20	0	0	0	0	0	3	1	0	26
Vermont:											
Barre	1	2	0	0	0	1	0	0	0	0	5
Burlington	1	0	0	0	0	0	0	0	0	1	5
Massachusetts:											
Boston	55	109	0	0	0	24	2	1	0	17	259
Fall River	3	0	0	0	0	6	1	0	0	5	40
Springfield	6	26	0	0	0	0	0	0	0	10	40
Worcester	8	9	0	0	0	5	0	0	0	9	67
Rhode Island:											
Pawtucket	1	4	0	0	0	2	0	0	0	0	20
Providence	9	8	0	0	0	4	0	0	0	1	64

[1] Population Jan. 1, 1920.

City reports for week ended March 14, 1925—Continued

Division, State, and city	Scarlet fever: Cases, estimated expectancy	Scarlet fever: Cases reported	Smallpox: Cases, estimated expectancy	Smallpox: Cases reported	Smallpox: Deaths reported	Tuberculosis, deaths reported	Typhoid fever: Cases, estimated expectancy	Typhoid fever: Cases reported	Typhoid fever: Deaths reported	Whooping cough, cases reported	Deaths, all causes
NEW ENGLAND—continued											
Connecticut:											
Bridgeport	7	18	0	0	0	4	0	1	0	4	41
Hartford	6	11	1	0	0	5	0	0	0	12	53
New Haven	5	18	0	0	0	1	0	0	0	5	40
MIDDLE ATLANTIC											
New York:											
Buffalo	19	25	0	1	0	11	0	1	1	25	153
New York	197	346	0	0	0	[1] 105	7	8	0	129	1,608
Rochester	12	79	0	0	0	3	0	0	0	6	71
Syracuse	16	3	0	0	0	2	1	0	0	3	45
New Jersey:											
Camden	3	29	0	6	0	2	1	0	0	13	39
Newark	24	58	0	0	0	9	1	0	0	68	127
Trenton	4	2	0	0	0	3	0	0	0	3	42
Pennsylvania:											
Philadelphia	63	223	0	2	0	39	3	1	0	91	613
Pittsburgh	21	84	0	0	0	15	0	0	0	9	306
Reading	3	18	0	0	0	2	0	0	0	8	38
Scranton	4	3	0	0	0	1	0	0	0	5	-------
EAST NORTH CENTRAL											
Ohio:											
Cincinnati	11	36	1	1	0	8	0	0	0	4	127
Cleveland	36	46	0	1	0	17	2	0	0	20	226
Columbus	8	22	1	9	0	2	0	1	0	4	93
Toledo	15	40	4	0	0	3	1	1	0	27	84
Indiana:											
Fort Wayne	2	7	1	0	0	3	0	0	0	1	23
Indianapolis	11	0	2	22	0	6	0	0	1	18	130
South Bend	4	4	1	0	0	1	0	0	0	0	19
Terre Haute	2	4	1	1	0	1	0	0	0	0	24
Illinois:											
Chicago	89	326	3	3	0	71	3	4	0	119	816
Cicero	2	9	0	0	0	0	0	0	0	0	5
Peoria	3	9	1	1	0	1	0	0	0	0	19
Springfield	1	4	1	0	0	0	0	0	0	0	27
Michigan:											
Detroit	84	122	4	3	0	24	1	0	0	35	299
Flint	7	1	1	0	0	0	0	0	0	0	18
Grand Rapids	9	48	1	1	0	2	0	0	0	1	36
Wisconsin:											
Madison	3	4	1	0	0	0	0	0	0	7	9
Milwaukee	35	16	1	10	2	6	0	0	0	43	113
Racine	5	3	1	0	0	0	0	0	0	2	8
Superior	2	18	5	1	0	0	1	0	0	0	6
WEST NORTH CENTRAL											
Minnesota:											
Duluth	5	23	1	1	0	1	0	0	0	0	26
Minneapolis	35	80	7	19	4	4	1	1	0	3	113
St. Paul	27	22	7	4	0	4	0	2	1	14	66
Iowa:											
Davenport	2	1	2	2	-------	-------	0	0	-------	0	-------
Des Moines	9	2	2	1	-------	-------	0	0	-------	0	-------
Sioux City	2	0	1	1	-------	-------	0	0	-------	0	-------
Waterloo	3	0	1	8	-------	-------	0	0	-------	-------	-------
Missouri:											
Kansas City	12	86	2	2	0	1	0	0	0	1	140
St. Joseph	2	4	0	0	0	1	0	0	0	1	38
St. Louis	29	118	2	9	0	18	1	2	1	7	259
North Dakota:											
Fargo	1	0	0	0	0	0	0	0	0	0	12
Grand Forks	0	0	0	0	-------	-------	0	0	-------	0	-------
South Dakota:											
Aberdeen	-------	3	-------	0	-------	-------	-------	0	-------	0	-------
Sioux Falls	3	2	1	0	0	0	0	0	0	0	8

[1] Pulmonary tuberculosis only.

City reports for week ended March 14, 1925—Continued

Division, State, and city	Scarlet fever: Cases, estimated expectancy	Scarlet fever: Cases reported	Smallpox: Cases, estimated expectancy	Smallpox: Cases reported	Smallpox: Deaths reported	Tuberculosis, deaths reported	Typhoid fever: Cases, estimated expectancy	Typhoid fever: Cases reported	Typhoid fever: Deaths reported	Whooping cough, cases reported	Deaths, all causes
WEST NORTH CENTRAL—continued											
Nebraska:											
Lincoln	4	1	0	0	0	2	0	0	0	0	11
Omaha	5	3	2	16	0	1	0	0	0	1	48
Kansas:											
Topeka	2	6	1	0	0	0	0	0	0	0	22
Wichita	2	3	3	0	0	1	0	0	0	3	23
SOUTH ATLANTIC											
Delaware:											
Wilmington	2	2	0	0	0	4	0	0	0	1	34
Maryland:											
Baltimore	38	50	0	0	0	15	2	5	0	111	260
Cumberland	0	1	0	0	0	3	0	0	0	-------	12
Frederick	1	1	0	0	0	0	0	0	0	-------	4
District of Columbia:											
Washington	23	42	1	1	0	7	1	1	0	20	136
Virginia:											
Lynchburg	0	0	0	0	0	0	0	0	0	3	16
Norfolk	2	1	0	0	0	1	0	0	0	8	-------
Richmond	3	2	0	0	0	1	0	0	0	2	54
Roanoke	1	0	1	0	0	0	0	0	0	0	16
West Virginia:											
Charleston	1	0	1	1	0	2	0	0	0	2	22
Huntington	1	0	0	3	-------	-------	0	2	-------	0	-------
Wheeling	1	4	1	0	0	1	0	1	0	4	28
North Carolina:											
Raleigh	0	0	0	1	0	1	0	0	0	0	8
Wilmington	0	1	1	3	0	0	0	0	0	0	5
Winston-Salem	1	0	2	15	0	1	0	0	0	3	16
South Carolina:											
Charleston	0	0	0	1	0	1	0	0	0	1	28
Columbia	0	1	0	0	0	1	0	0	0	6	16
Greenville	0	0	1	6	0	0	0	0	0	0	13
Georgia:											
Atlanta	5	2	4	1	0	4	0	3	1	1	79
Brunswick	0	0	1	0	0	1	0	0	0	0	4
Savannah	1	1	1	0	0	1	0	0	1	2	42
Florida:											
St. Petersburg	2	0	0	0	0	0	0	0	0	0	19
Tampa	0	-------	1	-------	-------	-------	2	-------	-------	-------	-------
EAST SOUTH CENTRAL											
Kentucky:											
Covington	1	7	0	0	0	3	0	0	0	0	22
Lexington	1	0	0	0	0	1	0	0	0	0	15
Louisville	4	16	1	0	0	3	0	1	0	2	93
Tennessee:											
Memphis	3	2	1	1	0	6	0	3	0	-------	69
Nashville	2	-------	1	-------	0	5	0	-------	2	-------	68
Alabama:											
Birmingham	1	26	1	70	0	6	1	0	1	3	85
Mobile	0	0	2	0	0	3	0	1	1	0	38
Montgomery	0	0	0	4	0	0	0	0	0	0	23
WEST SOUTH CENTRAL											
Arkansas:											
Fort Smith	1	1	1	1	-------	-------	0	0	-------	11	-------
Little Rock	1	0	0	0	0	3	0	0	0	0	-------
Louisiana:											
New Orleans	4	15	3	0	0	5	2	4	0	5	179
Shreveport	-------	0	-------	1	0	1	-------	0	0	0	23
Oklahoma:											
Oklahoma	2	3	5	0	0	1	0	0	0	0	28
Texas:											
Dallas	1	5	7	0	0	4	0	0	0	3	43
Galveston	0	0	1	1	0	2	1	1	0	0	9
Houston	1	1	1	13	0	3	0	0	0	0	48
San Antonio	0	1	0	0	0	10	0	1	1	0	63

City reports for week ended March 14, 1925—Continued

Division, State, and city	Scarlet fever: Cases, estimated expectancy	Scarlet fever: Cases reported	Smallpox: Cases, estimated expectancy	Smallpox: Cases reported	Smallpox: Deaths reported	Tuberculosis, deaths reported	Typhoid fever: Cases, estimated expectancy	Typhoid fever: Cases reported	Typhoid fever: Deaths reported	Whooping cough, cases reported	Deaths, all causes
MOUNTAIN											
Montana:											
Billings	1	4	0	0	0	0	0	0	0	8	4
Great Falls	1	2	1	1	0	0	0	0	0	0	3
Helena	0	0	0	0	0	0	0	0	0	0	9
Missoula	1	0	0	0	0	0	0	0	0	0	7
Idaho:											
Boise	1	0	1	2	0	0	0	0	0	0	3
Colorado:											
Denver	12	11	3	0	0	10	0	0	0	0	88
Pueblo	1	0	0	0	0	0	0	2	0	0	9
New Mexico:											
Albuquerque	2	0	0	0	0	7	0	0	0	0	11
Arizona:											
Phoenix	------	0	------	0	0	19	------	0	0	2	43
Utah:											
Salt Lake City	3	3	2	0	0	0	0	0	0	10	34
Nevada:											
Reno	0	1	1	7	0	0	0	0	0	0	4
PACIFIC											
Washington:											
Seattle	9	19	1	21	------	------	1	4	------	56	------
Spokane	4	4	7	3	------	------	0	0	------	5	------
Tacoma	2	3	2	4	0	1	1	0	0	0	13
Oregon:											
Portland	6	5	5	20	0	6	1	0	0	6	------
California:											
Los Angeles	14	41	2	44	1	31	2	1	0	77	230
Sacramento	2	1	1	5	0	0	0	0	0	------	20
San Francisco	17	11	44	8	0	14	1	0	0	38	147

Division, State, and city	Cerebrospinal meningitis: Cases	Cerebrospinal meningitis: Deaths	Lethargic encephalitis: Cases	Lethargic encephalitis: Deaths	Pellagra: Cases	Pellagra: Deaths	Poliomyelitis (infantile paralysis): Cases, estimated expectancy	Poliomyelitis: Cases	Poliomyelitis: Deaths	Typhus fever: Cases	Typhus fever: Deaths
NEW ENGLAND											
Massachusetts:											
Boston	0	0	1	0	0	0	0	0	0	0	0
Springfield	0	0	1	1	0	0	0	0	0	0	0
Rhode Island:											
Providence	1	0	0	0	0	0	0	0	0	0	0
Connecticut:											
Hartford	0	0	0	1	0	0	0	0	0	0	0
MIDDLE ATLANTIC											
New York:											
New York	4	6	5	4	0	0	1	0	0	0	0
New Jersey:											
Newark	0	0	2	0	0	0	0	0	0	0	0
Pennsylvania:											
Philadelphia	1	1	0	0	0	1	0	0	0	0	0
Pittsburgh	1	2	0	0	0	0	0	0	0	0	0
EAST NORTH CENTRAL											
Ohio:											
Cincinnati	0	1	0	0	0	0	0	0	0	0	0
Cleveland	2	0	0	2	0	0	0	0	0	0	0
Columbus	1	1	0	0	0	0	0	0	0	0	0
Indiana:											
Fort Wayne	1	1	0	0	0	0	0	0	0	0	0

City reports for week ended March 14, 1925—Continued

Division, State, and city	Cerebrospinal meningitis		Lethargic encephalitis		Pellagra		Poliomyelitis (infantile paralysis)			Typhus fever	
	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases, estimated expectancy	Cases	Deaths	Cases	Deaths
EAST NORTH CENTRAL—continued											
Illinois:											
Chicago	1	1	2	0	0	0	1	0	0	0	0
Michigan:											
Detroit	2	0	1	0	0	0	0	0	0	0	0
Wisconsin:											
Milwaukee	0	0	0	0	0	0	0	1	0	0	0
WEST NORTH CENTRAL											
Minnesota:											
St. Paul	0	0	1	0	0	0	0	0	0	0	0
Nebraska:											
Lincoln	0	0	0	0	0	0	0	1	1	0	0
SOUTH ATLANTIC											
Maryland:											
Baltimore	1	1	1	1	0	0	0	0	0	0	1
District of Columbia:											
Washington	1	1	1	1	0	0	0	0	0	0	0
Georgia:											
Atlanta	0	0	0	0	0	1	0	0	0	0	0
Florida:											
St. Petersburg	0	1	0	0	0	0	0	0	0	0	0
EAST SOUTH CENTRAL											
Tennessee:											
Memphis	0	0	0	0	1	1	0	0	0	0	0
Nashville	------	2	------	0	------	0	0	------	0	------	0
Alabama:											
Birmingham	0	0	0	0	2	0	0	1	1	0	0
Montgomery	0	0	0	0	1	0	0	0	0	0	0
WEST SOUTH CENTRAL											
Louisiana:											
New Orleans	0	0	0	0	1	1	0	0	0	0	0
Texas:											
Galveston	0	0	0	0	0	1	0	0	0	0	0
Houston	0	1	0	0	0	1	0	0	0	0	0
MOUNTAIN											
Utah:											
Salt Lake City	1	1	0	0	0	0	0	0	0	0	0
PACIFIC											
Oregon:											
Portland	0	1	0	0	0	0	0	0	0	0	0
California:											
Los Angeles	0	0	0	0	0	1	0	2	0	0	0

The following table gives the rates per hundred thousand population for 105 cities for the 10-week period ended March 14, 1925. The population figures used in computing the rates were estimated as of July 1, 1923, as this is the latest date for which estimates are available. The 105 cities reporting cases had an estimated aggregate population of nearly 29,000,000 and the 97 cities reporting deaths had more than 28,000,000 population. The number of cities in-

cluded in each group and the aggregate populations are shown in a separate table below.

Summary of weekly reports from cities, January 4, to March 14, 1925—Annual rates per 100,000 population [1]

DIPHTHERIA CASE RATES

	Week ended—									
	Jan. 10	Jan. 17	Jan. 24	Jan. 31	Feb. 7	Feb. 14	Feb. 21	Feb. 28	Mar. 7	Mar. 14
Total	169	[2] 172	[2] 163	[3] 166	[2] 175	[2] 168	149	[4] 169	162	[5] 168
New England	256	179	171	199	191	246	241	[4] 189	233	176
Middle Atlantic	181	188	175	155	171	165	163	178	167	214
East North Central	132	141	130	[3] 135	145	132	123	119	114	128
West North Central	143	255	199	251	255	259	209	299	282	201
South Atlantic	173	[2] 106	[2] 138	128	[2] 153	[2] 183	156	114	104	[6] 93
East South Central	120	91	80	97	63	69	80	51	63	[7] 40
West South Central	144	195	162	148	176	162	125	162	144	158
Mountain	239	153	239	134	191	95	162	153	86	105
Pacific	194	206	223	293	270	180	165	258	235	197

MEASLES CASE RATES

	Jan. 10	Jan. 17	Jan. 24	Jan. 31	Feb. 7	Feb. 14	Feb. 21	Feb. 28	Mar. 7	Mar. 14
Total	215	[2] 141	[2] 213	[3] 214	[2] 254	[2] 297	383	[4] 358	418	[5] 451
New England	395	440	497	484	576	661	720	[4] 585	656	542
Middle Atlantic	169	157	187	205	205	287	373	343	428	518
East North Central	417	127	379	[3] 373	453	515	688	632	789	740
West North Central	19	12	27	21	17	31	27	73	68	75
South Atlantic	83	[2] 43	[2] 38	37	[2] 49	[2] 98	110	81	100	[6] 150
East South Central	29	46	74	91	51	74	51	46	86	[7] 7
West South Central	5	23	14	14	37	51	14	51	23	88
Mountain	134	267	248	286	782	153	620	916	29	763
Pacific	194	160	55	17	61	29	64	61	107	110

SCARLET FEVER CASE RATES

	Jan. 10	Jan. 17	Jan. 24	Jan. 31	Feb. 7	Feb. 14	Feb. 21	Feb. 28	Mar. 7	Mar. 14
Total	369	[2] 355	[2] 370	[3] 364	[2] 412	[2] 400	390	[4] 408	395	[5] 432
New England	661	561	596	534	614	564	606	[4] 558	584	534
Middle Atlantic	324	294	326	322	373	407	376	412	372	439
East North Central	383	375	369	[3] 379	426	397	432	434	433	497
West North Central	757	755	804	779	871	728	742	734	775	719
South Atlantic	160	[2] 243	[2] 189	185	[2] 255	[2] 277	167	203	171	[6] 224
East South Central	229	183	183	217	97	212	223	183	194	[7] 336
West South Central	148	116	195	204	162	121	125	144	185	107
Mountain	382	534	305	258	334	382	248	315	286	200
Pacific	189	183	220	226	258	177	186	223	218	229

SMALLPOX CASE RATES

	Jan. 10	Jan. 17	Jan. 24	Jan. 31	Feb. 7	Feb. 14	Feb. 21	Feb. 28	Mar. 7	Mar. 14
Total	57	[2] 58	[2] 70	[3] 67	[2] 76	[2] 79	66	[4] 66	62	[5] 61
New England	0	0	0	0	0	0	0	[4] 0	0	0
Middle Atlantic	3	10	6	9	2	4	2	3	1	5
East North Central	40	39	48	[3] 35	39	35	56	28	42	39
West North Central	220	193	180	195	145	193	126	120	114	124
South Atlantic	30	[2] 64	[2] 38	45	[2] 62	[2] 98	67	43	51	[6] 60
East South Central	395	217	675	652	823	675	532	583	652	[7] 495
West South Central	65	32	32	60	125	139	83	116	74	74
Mountain	29	57	95	48	29	162	86	57	48	95
Pacific	148	212	209	177	267	220	215	313	206	247

[1] The figures given in this table are rates per 100,000 population, annual basis, and not the number of cases reported. Populations used are estimated as of July 1, 1923.
[2] Wilmington, Del., not included. Report not received at time of going to press.
[3] Racine, Wis., not included.
[4] Hartford, Conn., not included.
[5] Tampa, Fla., and Nashville, Tenn., not included.
[6] Tampa, Fla., not included.
[7] Nashville, Tenn., not included.

Summary of weekly reports from cities, January 4, to March 14, 1925—Annual rates per 100,000 population—Continued

TYPHOID FEVER CASE RATES

	Week ended—									
	Jan. 10	Jan. 17	Jan. 24	Jan. 31	Feb. 7	Feb. 14	Feb. 21	Feb. 28	Mar. 7	Mar. 14
Total	36	[2] 21	[2] 17	[2] 18	[2] 13	[2] 13	11	[4] 14	11	[5] 9
New England	15	25	20	7	30	20	0	[4] 13	7	5
Middle Atlantic	49	21	20	19	13	6	10	8	10	5
East North Central	23	23	11	[3] 10	8	6	6	7	11	4
West North Central	6	10	6	12	0	10	4	17	6	10
South Atlantic	55	[2] 21	[2] 11	37	[2] 17	[2] 34	8	20	8	[6] 21
East South Central	51	17	29	23	11	40	34	34	34	[7] 33
West South Central	70	70	42	60	23	46	42	42	28	28
Mountain	10	0	48	19	29	19	38	76	10	19
Pacific	26	6	15	3	17	12	23	9	15	15

INFLUENZA DEATH RATES

	Jan. 10	Jan. 17	Jan. 24	Jan. 31	Feb. 7	Feb. 14	Feb. 21	Feb. 28	Mar. 7	Mar. 14
Total	21	[2] 22	[2] 22	[2] 23	[2] 30	[2] 28	30	[4] 34	30	[5] 34
New England	17	27	10	27	47	27	17	[4] 40	17	35
Middle Atlantic	20	18	20	16	24	22	21	20	15	24
East North Central	16	15	18	[3] 12	13	17	18	24	27	33
West North Central	13	2	20	15	20	11	22	37	35	33
South Atlantic	35	[2] 47	[2] 23	39	[2] 49	[2] 55	55	49	53	[6] 29
East South Central	46	46	63	74	69	63	74	126	103	106
West South Central	41	87	92	82	97	122	153	148	143	107
Mountain	19	29	10	38	57	57	57	19	19	48
Pacific	20	12	12	20	41	4	12	29	29	16

PNEUMONIA DEATH RATES

	Jan. 10	Jan. 17	Jan. 24	Jan. 31	Feb. 7	Feb. 14	Feb. 21	Feb. 28	Mar. 7	Mar. 14
Total	192	[2] 215	[2] 211	[2] 206	[2] 225	[2] 222	216	[4] 201	205	[5] 223
New England	122	157	216	241	211	239	241	[4] 242	226	229
Middle Atlantic	228	260	234	230	253	231	216	185	210	214
East North Central	152	152	142	[3] 145	164	168	184	171	195	241
West North Central	90	107	120	118	134	131	131	166	140	175
South Atlantic	246	[2] 294	[2] 275	252	[2] 315	[2] 270	252	305	268	[6] 241
East South Central	292	189	320	303	326	320	320	292	269	422
West South Central	260	449	362	229	352	464	408	260	229	178
Mountain	229	248	324	315	191	277	219	267	162	210
Pacific	184	163	208	217	196	192	213	163	139	155

[2] Wilmington, Del., not included. Report not received at time of going to press.
[3] Racine, Wis., not included.
[4] Hartford, Conn , not included.
[5] Tampa, Fla., ahd Nashville, Tenn., not included.
[6] Tampa, Fla., not included.
[7] Nashville, Tenn., not included.

Number of cities included in summary of weekly reports and aggregate population of cities in each group, estimated as of July 1, 1923

Group of cities	Number of cities reporting cases	Number of cities reporting deaths	Aggregate population of cities reporting cases	Aggregate population of cities reporting deaths
Total	105	97	28, 898, 350	28, 140, 934
New England	12	12	2, 098, 746	2, 098, 746
Middle Atlantic	10	10	10, 304, 114	10, 304, 114
East North Central	17	17	7, 032, 535	7, 032, 535
West North Central	14	11	2, 515, 330	2, 381, 454
South Atlantic	22	22	2, 566, 901	2, 566, 901
East South Central	7	7	911, 885	911, 885
West South Central	8	6	1, 124, 564	1, 023, 013
Mountain	9	9	546, 445	546, 445
Pacific	6	3	1, 797, 830	1, 275, 841

FOREIGN AND INSULAR

PLAGUE ON VESSEL

Motor ship Silver Larch—At Port Said, Egypt.—On March 16, 1925, a case of suspect plague was landed at Port Said, Egypt, from the motor ship *Silver Larch*, from Yokohama and way ports. The case was declared positive for plague March 18, 1925. The vessel left Port Said for Boston, New York, and Philadelphia March 17, 1925. The *Silver Larch* left Yokohama December 23, touching at Kobe, Hongkong, Shanghai, Manila, and ports in Java and the Straits Settlements.

BRAZIL

Plague—Bahia—January-February, 1925—November, 1923-March, 1924.—Plague has been reported at Bahia, Brazil, as follows: Week ended January 10, 1925, 1 case, 1 death; week ended February 21, 1925, 2 cases, 1 death. November, 1923-March, 1924—Plague was reported at Bahia from November 11, 1923, to March 15, 1924, with 12 cases, 9 deaths.

CUBA

Cerebrospinal meningitis—Antilla.—During the period January 1-March 14, 1925, five cases of cerebrospinal meningitis with one death were notified at Antilla, Cuba. The cases occurred in Haitians recently arrived.

FINLAND

Lethargic encephalitis—Typhoid fever—February 1-15, 1925.—During the period February 1 to 15, 1925, 5 cases of lethargic encephalitis and 42 cases of typhoid fever were reported in Finland. Population, 3,435,249.

LITHUANIA

Typhoid fever—Typhus fever—January, 1925.—During the month of January, 1925, 38 cases of typhoid fever with 1 death, and 27 cases of typhus fever with 2 deaths were reported in Lithuania. Population, census of 1923, 2,028,972.

SWEDEN

Foot and mouth disease.—Under date of February 26, 1925, foot and mouth disease was reported seriously prevalent in the southern counties of Sweden, and to be increasing in area of prevalence.

UNION OF SOUTH AFRICA

Plague—Outbreak in a group of European families—February 1–7, 1925.—During the week ended February 7, 1925, seven cases of plague with five deaths were reported in the Union of South Africa, among natives. During the same period an outbreak of suspect plague was reported on four farms in Boshoff district, Transvaal. Four European families living in close connection with each other were affected. Plague was verified in one of this group who died February 6, 1925. For distribution of cases and deaths according to locality, see page 684.

VIRGIN ISLANDS

Communicable diseases—February, 1925.—During the month of February, 1925, communicable diseases were reported in the Virgin Islands of the United States as follows:

Island and disease	Cases	Remarks
St. Thomas and St. John:		
Chancroid	2	
Fish poisoning	5	
Gonorrhea	5	Imported, 2.
Malaria	3	Benign tertian.
Pellagra	1	
Syphilis	7	Secondary.
Tetanus	1	
Tuberculosis	2	Chronic pulmonary, 1; of peritoneum, 1
St. Croix:		
Chancroid	1	
Filariasis	6	
Gonorrhea	1	
Leprosy	1	
Syphilis	6	Secondary.
Trachoma	5	
Tuberculosis	1	Chronic pulmonary.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

The reports contained in the following tables must not be considered as complete or final as regards either the lists of countries included or the figures for the particular countries for which reports are given.

Reports Received During Week Ended April 3, 1925 [1]

CHOLERA

Place	Date	Cases	Deaths	Remarks
India				Jan. 18-24, 1925: Cases, 2,938; deaths, 1,762.
Calcutta	Feb. 1-7	15	15	
Madras	Feb. 15-21	10	7	
Siam:				
Bangkok	Feb. 1-7	2	1	

PLAGUE

Place	Date	Cases	Deaths	Remarks
Brazil:				
Bahia	Feb. 15-Jan. 10	3	3	
Canary Islands:				
Las Palmas	Jan. 21-23	2		Stated to be endemic.
Ceylon:				
Colombo	Feb. 8-14	4	2	

[1] From medical officers of the Public Health Service, American consuls, and other sources.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

Reports Received During Week Ended April 3, 1925—Continued

PLAGUE—Continued

Place	Date	Cases	Deaths	Remarks
India				Jan. 18-24, 1925: Cases, 4,095 deaths, 3,480.
Karachi	Feb. 15-21	1	1	
Madras presidency	Jan. 18-24	222	170	
Rangoon	Feb. 1-7	17	13	
Java:				
East Java—				
Sidoardjo	Jan. 2			Declared epidemic. Province of Soerabaya.
Soerabaya	Jan. 15-21	1	1	
West Java—				
Cheribon	Jan. 1-14		44	Cheribon Province.
Pekalongan	do		81	Pekalongan Province.
Tegal	do		37	Do.
Union of South Africa				Feb. 1-7, 1925: Cases, 7; deaths, 5, natives. European—1 case, 1 death.
Cape Province—				
Kimberley	Feb. 1-7	1	1	On farm.
Transvaal—				
Boshof District	do	4	3	Do.
Wodehouse District	do	2	1	Do.

SMALLPOX

Place	Date	Cases	Deaths	Remarks
China:				
Amoy	Feb. 8-14			Present.
Antung	Feb. 9-22	5		
Manchuria—				
Harbin	Jan. 22-Feb. 11	4		
Nanking	Jan. 18-Feb. 21			Do.
Colombia:				
Buenaventura	Feb. 15-22	1		
Great Britain:				
Newcastle-on-Tyne	Mar. 1-7	1		
India				Jan. 18-24, 1925: Cases, 2,882; deaths, 631.
Bombay	Feb. 1-7	42	28	
Calcutta	do	219	128	
Madras	Feb. 15-21	94	24	
Rangoon	Feb. 1-7	91	15	
Java:				
East Java—				
Soerabaya	Jan. 15-21	62	11	
West Java—				
Buitenzorg	Dec. 25-31	1		Batavia Residency.
Cheribon	Nov. 25-Dec. 31	5		Cheribon Residency.
Do.	Jan. 1-7	2		Do.
Pemalang	Jan. 8-14	1		Do.
Lithuania				Jan. 1-31, 1925: Cases, 2.
Mexico:				
Tampico	Mar. 1-10	4	1	
Vera Cruz	Mar. 9-15		2	
Portugal:				
Lisbon	Feb. 8-28	14	2	
Sierra Leone:				
Freetown	Feb. 7-14	2		From S. S. Elmina.
Spain:				
Malaga	Feb. 20-Mar. 7		1	
Valencia	Mar. 1-7	1		
Syria:				
Aleppo	Feb. 15-21	8	1	Estimated.
Tunis:				
Tunis	Mar. 5-11	18	21	
Union of South Africa:				
Cape Province	Feb. 1-7			Outbreaks.
Transvaal	do			Do.

TYPHUS FEVER

Place	Date	Cases	Deaths	Remarks
Algeria:				
Algiers	Feb. 11-20	1		
Chile:				
Concepcion	Jan. 27-Feb. 2		1	
Lithuania				Jan. 1-31, 1925: Cases, 27; deaths, 2.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

Reports Received During Week Ended April 3, 1925—Continued

TYPHUS FEVER—Continued

Place	Date	Cases	Deaths	Remarks
Mexico:				
San Luis Potosi	Mar. 8-14		1	
Tunis:				
Tunis	Mar. 5-11	1		
Union of South Africa:				
Cape Province	Feb. 1-7			Outbreaks.

Reports Received from December 27, 1924, to March 27, 1925 [1]

CHOLERA

Place	Date	Cases	Deaths	Remarks
Ceylon				June 29-Dec. 27, 1924: Cases, 14, deaths, 13.
Colombo	Nov. 16-22	1		
Do	Jan. 11-24	2	2	
India				Oct. 19, 1924, to Jan. 3, 1925: Cases, 27,164; deaths, 16,228. Jan. 4-17, 1925: Cases, 5,003; deaths, 2,943.
Bombay	Nov. 23-Dec. 20	4	4	
Do	Jan. 18-24	1	1	
Calcutta	Oct. 26-Jan. 3	59	51	
Do	Jan. 4-31	57	52	
Madras	Nov. 16-Jan. 3	69	40	
Do	Jan. 4-Feb. 14	121	85	
Rangoon	Nov. 9-Dec. 20	9	2	
Do	Jan. 4-31	6	4	
Indo-China				Aug. 1-Sept. 30, 1924: Cases, 14; deaths, 10.
Province—				
Anam	Aug. 1-31	1	1	
Cambodia	Aug. 1-Sept. 30	6	5	
Cochin-China	do	7	4	
Saigon	Nov. 30-Dec. 6	1		
Siam:				
Bangkok	Nov. 9-29	4	2	
Do	Jan. 18-31	3	1	

PLAGUE

Place	Date	Cases	Deaths	Remarks
Azores:				
Fayal Island—				
Castelo Branco	Nov. 25			Present with several cases.
Feteira	do	1		
St. Michael Island	Nov. 2-Jan. 3	30	13	
British East Africa:				
Tanganyika Territory	Nov. 23-Dec. 27	17	10	
Uganda	Aug.-Nov., 1924	242	211	
Canary Islands:				
Las Palmas	Feb. 4	1		Stated to have been infected with plague Sept. 30, 1924.
Realejo Alto	Dec. 19	3	1	Vicinity of Santa Cruz de Teneriffe.
Teneriffe—				
Santa Cruz	Jan. 3	1		In vicinity.
Celebes:				
Macassar	Oct. 29			Epidemic.
Ceylon:				
Colombo	Nov. 9-Jan. 3	12	9	
Do	Jan. 4-Feb. 7	4	8	Five plague rodents.
China:				
Foochow	Dec. 28-Jan. 3			Present.
Nanking	Nov. 23-Jan. 31			Do.
Shing Hsien	October, 1924		790	
Ecuador:				
Chimborazo Province—				
Alausi District	Jan. 14		14	At two localities on Guayaquil and Quito Railway.
Guayaquil	Nov. 16-Dec. 31	9	3	Rats taken, 27,004; found infected, 92.
Do	Jan. 1-Feb. 15	31	12	Rats taken, 31,252; rats found infected, 144.
Yaguachi	Feb. 1-15	1	1	

[1] From medical officers of the Public Health Service, American consuls, and other sources.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

Reports Received from December 27, 1924, to March 27, 1925—Continued

PLAGUE—Continued

Place	Date	Cases	Deaths	Remarks
Egypt				Year 1924: Cases, 373. Jan. 1-28, 1925: Cases, 15.
City—				
Alexandria	Year 1924	2	2	Last case, Nov. 26.
Ismailia	do	1	1	Last case, July 6.
Port Said	do	6	4	Last case, Dec. 7.
Suez	do	20	13	Last case, Dec. 20.
Province—				
Dakhalia	Jan. 1-8	1	1	
Kalioubiah	do	3		
Menoufieh	do	7	3	
Gold Coast				September-November, 1924: Deaths, 48.
Hawaii:				
Honokaa	Nov. 4	1		Plague-infected rodents found Dec. 9, 1924, and Jan. 15, 1925.
India				Oct. 19, 1924, to Jan. 3, 1925: Cases, 28,154; deaths, 21,505. Jan. 4-17, 1925: Cases, 8,269; deaths, 6,983.
Bombay	Nov. 22-Jan. 3	4	3	
Do	Jan. 4-17	2	2	
Calcutta	Jan. 18-24	1	1	
Karachi	Nov. 30-Dec. 16	2	1	
Do	Jan. 4-24	10	9	
Do	Feb. 8-14	1	1	
Madras Presidency	Nov. 23-Dec. 20	528	379	
Do	Dec. 28-Jan. 3	157	108	
Do	Jan. 4-17	436	341	
Rangoon	Oct. 26-Jan. 3	26	25	
Do	Jan. 4-31	38	34	
Indo-China				Aug. 1-Sept. 30, 1924: Cases, 25; deaths, 20.
Province—				
Anam	Aug. 1-Sept. 30	4	4	
Cambodia	do	18	15	
Cochin-China	do	3	1	
Saigon	Jan. 11-17	2	1	Including 100 square kilometers of surrounding territory.
Do	Dec. 25-31	1	1	Do.
Iraq	June 29-Dec. 13	18	13	
Japan	Aug. 10-Dec. 6	19		
Java:				
East Java—				
Blitar	Nov. 11-22			Province of Kediri; epidemic.
Pare	Nov. 29			Do.
Soerabaya	Nov. 16-Dec. 13	53	55	
Do	Dec. 21-31	18	17	
West Java—				
Cheribon	Oct. 14-Nov. 3		14	
Do	Nov. 18-Dec. 22		80	
Do	Jan. 30			Town. Present.
Pasoeroean	Dec. 27			Province. Epidemic in one locality.
Pekalongan	Oct. 14-Nov. 3		29	
Do	Nov. 18-Dec. 31		177	
Probalingga	Dec. 27			Province. Epidemic.
Tegal	Oct. 14-Nov. 24		10	
Do	Dec. 25-31		16	Province.
Madagascar:				
Fort Dauphin (port)	Nov. 1-Dec. 15	12	5	
Itasy Province				Nov. 1-Dec. 15, 1924: Cases, 4; deaths, 2.
Majunga (port)	Nov. 1-30	1	1	
Moramanga Province				Nov. 1-Dec. 15, 1924: Cases, 49; deaths, 34.
Tamatave (port)	Nov. 1-30	1	1	
Tananarive Province				Oct. 16-Dec. 31, 1924: Cases, 298; deaths, 274.
Do				Jan. 1-15: Cases, 54; deaths, 48.
Tananarive (town)	Oct. 16-Nov. 30	8	7	Bubonic, pneumonic, septicemic.
Do	Dec. 16-31	4	4	
Do	Jan. 1-15	1	1	
Mauritius Island				Sept. 7-Oct. 18, 1924: Cases, 60; deaths, 53.
Morocco:				
Marrakech				Feb. 9, 1925: Present in native quarter of town. Stated to be pneumonic in form and of high mortality.
Nigeria				August-November, 1924: Cases, 387; deaths, 317.
Peru	February, 1925	6	6	

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

Reports Received from December 27, 1924, to March 27, 1925—Continued

PLAGUE—Continued

Place	Date	Cases	Deaths	Remarks
Siam:				
Bangkok	Dec. 28–Jan. 3	1	1	
Do	Jan. 25–31	1	1	
Siberia:				
Transbaikalia—				
Turga	October, 1924		3	On Chita Railroad.
Straits Settlements:				
Singapore	Nov. 9–15	1	1	
Do	Jan. 4–17	3	2	
Do	Jan. 25–31	3	2	
Syria:				
Beirut	Jan. 11–20	1		
Turkey:				
Constantinople	Jan. 9–15	5	5	
Union of South Africa	Jan. 4–31	17	5	Native cases, 3; deaths, 1; white, 1 case.
Cape Province—				
De Aar District	Nov. 22–Jan. 3	4	1	Native.
Do	Jan. 4–10	2		Natives; on farms.
Do	Jan. 25–31	1	1	Malay camp.
Dronfield	Dec. 7–13	1		8 miles from Kimberley.
Edenburg (town)	do			Plague infected house mouse.
Kimberley	Dec. 7–27	3	2	
Maraisburg District	Nov. 22–Dec. 13	4	2	Bubonic, on Goedshoop Farm.
Orange Free State—				
Bloemfontein District	Dec. 21–Jan. 3	5	2	
Do	Jan. 11–17	1	1	Native; on farm.
Ficksburg District	Dec. 28–Jan. 3	1	1	
Hoopstad District	Dec. 7–13	1		On farm.
Kroonstad District	Nov. 22–Jan. 3	2	1	
Do	Jan. 18–24	1	1	Native; on farm.
Philippolis District	Dec. 21–27	1		
Vredefort District	Dec. 7–20	2	2	On farms.
Steynsburg District	Jan. 4–10	1		Native; on farm. Province not stated.
Transvaal—				
Boshof District	Dec. 7–Jan. 3	3	3	On farm.
Do	Jan. 11–31	9	1	Native, 4 cases; white, 1 fatal case. On farms.
Smithfield	do	1		
Wolmaransstad District.	Nov. 22–29	1	1	On Farm Wolverspruit, Vaal River. Native.
On vessel:				
S. S. Conde				At Marseille, France, Nov. 8, 1924. Plague rat found. Vessel left for Tamatave, Madagascar, Nov. 12, 1924.
Steamship	November, 1924	1	1	At Majunga, Madagascar, from Djibuti, Red Sea port.

SMALLPOX

Place	Date	Cases	Deaths	Remarks
Algeria				July 1–Dec. 31, 1924: Cases, 409. Jan. 1–20, 1925: Cases, 107.
Algiers	Jan. 1–31	5		
Arabia:				
Aden	Jan. 25–Feb. 21	5		Imported.
Bolivia:				
La Paz	Nov. 1–Dec. 31	20	11	
Do	Jan. 1–31		5	
Brazil:				
Pernambuco	Nov. 9–Jan. 3	100	27	
Do	Jan. 4–17	22	12	
British East Africa:				
Kenya—				
Mombasa	Jan. 18–24	1		
Uganda—				
Entebbe	Oct. 1–31	4		
British South Africa:				
Northern Rhodesia	Oct. 28–Dec. 15	57	2	
Do	Jan. 27–Feb. 2	3		Natives.
Southern Rhodesia	Jan. 29–Feb. 4	1		

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

Reports Received from December 27, 1924, to March 27, 1925—Continued

SMALLPOX—Continued

Place	Date	Cases	Deaths	Remarks
Canada:				
British Columbia—				
Vancouver	Dec. 14-Jan. 3	32		
Do	Jan. 4-Mar. 7	223		
Victoria	Jan. 18-Feb. 7	2		
Manitoba—				
Winnipeg	Dec. 7-Jan. 3	14		
Do	Jan. 4-Feb. 27	30		
New Brunswick—				
Bonaventure and Gaspe Counties.	Jan. 1-31	1		
Northumberland	Feb. 8-14	1		County.
Ontario				Nov. 30-Dec. 27, 1924: Cases, 33.
Hamilton	Jan. 24-30	1		Dec. 28, 1924, to Feb. 28, 1925: Cases, 41; deaths, 1.
Ceylon				July 27-Nov. 29, 1924: Cases, 27; death, 1.
Colombo	Jan. 18-Feb. 7	4		
China:				
Amoy	Nov. 9-Feb. 7			Present.
Antung	Nov. 17-Dec. 28	5		
Do	Jan. 5-Feb. 8	10	1	
Foochow	Nov. 2-Jan. 27			Do.
Hongkong	Nov. 9-Jan. 3	6	2	
Do	Jan. 4-17	4	2	
Manchuria—				
Harbin	Jan. 15-21	1		
Nanking	Jan. 4-17			Do.
Shanghai	Dec. 7-27	1	2	
Do	Jan. 18-24	1		
Do	Feb. 1-14	3	4	Deaths among Chinese.
Chosen:				
Seoul	Dec. 1-31	1		
Czechoslovakia				April-June, 1924: Cases, 1; occurring in Province of Moravia.
Ecuador:				
Guayaquil	Nov. 16-Dec. 15	4		
Egypt:				
Alexandria	Nov. 12-Dec. 31	10		
Do	Jan. 8-28	8		
Esthonia				Dec. 1-31, 1924: Cases, 2.
France				July-December, 1924: Cases, 81.
St. Malo	Feb. 2-8	7	1	Believed to have been imported on steamship Ruyth from Sfax, Tunis.
Germany				June 29-Nov. 8, 1924: Cases, 7.
Frankfort-on-Main	Jan. 1-10	1		
Gibraltar	Dec. 8-14	1		
Gold Coast				July-September, 1924: Cases, 82; deaths, 1.
Great Britain:				
England and Wales	Nov. 23-Jan. 3	472		
Do	Jan. 4-Feb. 28	1,085		
Newcastle-on-Tyne	Jan. 18-Feb. 21	9		
Greece				January-June, 1924: Cases, 170; deaths, 27.
Do				July-December, 1924: Cases, 38; deaths, 26.
Saloniki	Nov. 11-Dec. 22	3		
India				Oct. 19, 1924, to Jan. 3, 1925: Cases, 12,564; deaths, 2,857.
Bombay	Nov. 2-Jan. 3	30	18	
Do	Jan. 4-31	72	37	Jan. 4-17, 1925: Cases, 5,039; deaths, 1,011.
Calcutta	Oct. 26-Jan. 8	307	170	
Do	Jan. 4-31	359	230	Mar. 5, 1925: Epidemic.
Karachi	Nov. 16-Jan. 3	16	2	
Do	Jan. 4-Feb. 14	52	6	
Madras	Nov. 16-Jan. 3	122	48	
Do	Jan. 4-Feb. 14	285	90	
Rangoon	Oct. 26-Jan. 3	86	28	
Do	Jan. 4-31	196	34	
Indo-China				Aug. 1-Sept. 30, 1924: Cases, 223; deaths, 76.
Province—				
Anam	Aug. 1-Sept. 30	49	11	
Cambodia	do	40	9	
Cochin-China	do	115	49	
Saigon	Nov. 16-Jan. 3	17	5	Including 100 sq. km. of surrounding country.
Do	Jan. 4-10	3	1	
Do	Jan. 25-31	5	2	Do.
Tonkin	Aug. 1-Sept. 30	19	7	

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

Reports Received from December 27, 1924, to March 27, 1925—Continued

SMALLPOX—Continued

Place	Date	Cases	Deaths	Remarks
Iraq	June 29-Dec. 13	137	66	
Bagdad	Nov. 9-Dec. 27	2	1	
Italy				June 29-Dec. 27, 1924: Cases, 63.
Jamaica				Nov. 30, 1924-Jan. 3, 1925: Cases, 50. Reported as alastrim.
Do				Jan. 4-31, 1925: Cases, 43. Reported as alastrim.
Kingston	Nov. 30-Dec. 27	4		Reported as alastrim.
Japan				Aug. 1-Nov. 15, 1924: Cases, 4.
Nagasaki	Feb. 9-15	3		
Java:				
East Java—				
Pasoeroean	Oct. 26-Nov. 1	9	1	
Do	Nov. 12-19			Epidemic in two native villages.
Soerabaya	Oct. 19-Dec. 31	685	212	
West Java—				
Batam	Oct. 14-20	2		
Batavia	Oct. 21-Nov. 14	2		
Do	Dec. 20-Jan. 2	19	4	
Cheribon	Oct. 14-Nov. 24	15		
Pekalongan	do	22		
Do	Dec. 25-31	3		Province.
Preanger	Nov. 18-24	1		
Latvia				Oct. 1-Nov. 30, 1924: Cases, 5.
Mexico:				
Durango	Dec. 1-31		5	
Do	Jan. 1-Feb. 28		10	
Guadalajara	Dec. 23-29		1	
Do	Jan. 6-12		1	
Do	Mar. 3-9		1	
Mexico City	Nov. 23-Dec. 27	5		
Do	Jan. 11-Feb. 14	9		
Monterey				Jan. 24, 1925: Outbreak. Mar. 14, 1925, present
Salina Cruz	Dec. 1-31	1	1	
Saltillo	Feb. 22-28		1	
Tampico	Dec. 11-31	5	4	
Do	Jan. 1-Feb. 28	40	15	
Vera Cruz	Dec. 1-Jan. 3		10	
Do	Jan. 5-Feb. 15		25	
Do	Feb. 22-Mar. 8		8	
Villa Hermosa	Dec. 28-Jan. 10			Present. Locality, capital, State of Tobasco.
Nigeria				January-June, 1924: Cases, 357; deaths, 87.
Do				July-November, 1924: Cases, 87; deaths, 25.
Persia:				
Teheran				Sept. 23-Dec. 21, 1924: Deaths, 12.
Peru:				
Arequipa	Nov. 24-30		1	
Poland				Sept. 21-Nov. 29, 1924: Cases, 19; deaths, 2.
Do				Nov. 30-Dec. 20, 1924: Cases, 10.
Portugal:				
Lisbon	Dec. 7-Jan. 3	17		
Do	Jan. 4-Feb. 7	45		
Oporto	Nov. 30-Dec. 27	3	2	
Do	Jan. 11-17	1		
Russia				January-June, 1924: Cases, 9,683; July-September, 1924: Cases, 1,251.
Siam:				
Bangkok	Dec. 28-Jan. 3	1	1	
Do	Jan. 18-31	4	6	
Spain:				
Barcelona	Nov. 27-Dec. 31		5	
Cadiz	Nov. 1-Dec. 31		51	
Do	Jan. 1-31		9	
Madrid	Year 1924		40	
Malaga	Nov. 23-Jan. 3		97	
Do	Jan. 4-Feb. 28		76	
Valencia	Nov. 30-Dec. 6	2		
Do	Feb. 15-21	2		
Switzerland:				
Lucerne	Nov. 1-Dec. 31	19		
Do	Jan. 1-31	24		

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

Reports Received from December 27, 1924 to March 27, 1925—Continued

SMALLPOX—Continued

Place	Date	Cases	Deaths	Remarks
Syria:				
Aleppo	Nov. 23-Dec. 27	13		
Do	Jan. 4-Feb. 14	55	17	
Damascus	Jan. 6-13	2		
Tripoli:				
Tripoli	July 14-Dec. 12	52		
Tunis:				
Tunis	Nov. 25-Dec. 29	42	35	
Do	Jan. 1-14		29	
Do	Jan. 22-Mar. 3		149	
Turkey:				
Constantinople	Dec. 13-19	5		
Union of South Africa				Nov. 1-Dec. 31, 1924: Cases, 14.
Cape Province—				
De Aar District	Jan. 25-31			Outbreak at railway camp.
Do	Nov. 9-Jan. 17			Outbreaks.
Orange Free State	Nov. 2-8			Do.
Ladybrand District	Jan. 15-31			Outbreak, on farm.
Transvaal	Nov. 9-Jan. 10			Outbreaks.
Uruguay				January-June, 1924: Cases, 101; deaths, 2.
Do				July-October, 1924: Cases, 45; deaths, 4.
On vessel:				
S. S. Habana	Feb. 18	1		At Santiago de Cuba, from Kingston, Jamaica.
S. S. Ruyth				At St. Malo, France, from Sfax, Tunis; believed to have imported smallpox infection.

TYPHUS FEVER

Place	Date	Cases	Deaths	Remarks
Algeria				July 1-Dec. 20, 1894: Cases, 101; deaths, 14.
Algiers	Nov. 1-Dec. 31	5	1	
Do	Jan. 1-31	3	3	
Bolivia:				
La Paz	Nov. 1-Dec. 31	3		
Do	Jan. 1-31	2		
Bulgaria				January-June, 1924: Cases, 191; deaths, 28.
Do				July-October, 1924: Cases, 5.
Chile:				
Concepcion	Nov. 25-Dec. 1		1	
Do	Jan. 6-12		2	
Iquique	Nov. 31-Dec. 1		2	
Do	Feb. 1-7		1	
Talcahuano	Nov. 16-Dec. 20		5	
Do	Jan. 4-10		1	
Valparaiso	Nov. 25-Dec. 7		4	
Do	Jan. 11-Feb. 14		9	
Chosen:				
Seoul	Nov. 1-30	1	1	
Czechoslovakia				December, 1924: Cases, 5.
Egypt:				
Alexandria	Dec. 3-9	1	1	
Cairo	Oct. 1-Dec. 23	13	8	
Esthonia				Dec. 1-31, 1924: Cases, 5.
France				July-October, 1924: Cases, 7.
Gold Coast				Oct. 1-31, 1924: 1 case.
Greece				May-June, 1924: Cases, 116; deaths, 8
Do				July-December, 1924: Cases, 40; deaths, 4.
Saloniki	Nov. 17-Dec. 15	3	2	
Do	Jan. 25-31	1		
Japan				Aug. 1-Nov. 15, 1924: Cases, 2.
Latvia				October-December, 1924: Cases, 30.
Lithuania				August-October, 1924: Cases, 15; deaths, 1.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

Reports Received from December 27, 1924, to March 27, 1925—Continued

TYPHUS FEVER—Continued

Place	Date	Cases	Deaths	Remarks
Mexico:				
Durango	Dec. 1-31		1	
Guadalajara	Dec. 23-29		1	
Mexico City	Nov. 9-Jan. 3	80		Including municipalities in Federal District.
Do	Jan. 11-Feb. 14	40		Do.
Morocco				November, 1924: Cases, 5.
Palestine				Nov. 12-Dec. 8, 1924: Cases, 7.
Ekron	Dec. 23-29	1		
Jerusalem	do	2		
Do	Jan. 20-26	1		
Mikveh Israel	do	1		
Ramleh	Feb. 10-16	1		
Peru:				
Arequipa	Nov. 24-30		1	
Poland				Sept. 28-Dec. 20, 1924: Cases, 542; deaths, 33.
Portugal:				
Lisbon	Dec. 29-Jan. 4		2	
Oporto	Jan. 4-Feb. 7	2		
Rumania				January-June, 1924: Cases, 2,906; deaths, 328.
Do				July-August, 1924: Cases, 80; deaths, 12.
Constanza	Dec. 1-10	1		
Russia				Jan. 1-June 30, 1924: Cases, 92,000. July-Sept., 1924: Cases 5,225.
Leningrad	June 29-Nov. 22	12		
Spain:				
Madrid	Year 1924		3	
Malaga	Dec. 21-27		1	
Sweden:				
Goteborg	Jan. 18-24	1		
Tunis				July 1-Dec. 20, 1924: Cases, 40.
Turkey:				
Constantinople	Nov. 15-Dec. 19	6	1	
Do	Jan. 2-22	6		
Do	Feb. 1-7	1	1	
Union of South Africa				Nov. 1-Dec. 31, 1924: Cases, 345; deaths, 87.
Cape Province	Nov. 1-Dec. 31	126	24	Dec. 21, 1924-Jan. 17, 1925: Outbreaks.
East London	Nov. 16-22	1		
Do	Jan. 18-24	1		
Natal	Nov. 1-Dec. 31	130	50	
Do	Jan. 18-24			Outbreaks.
Orange Free State	Nov. 1-Dec. 31	59	8	Jan. 11-17, 1925: Outbreaks.
Transvaal	do	30	5	
Yugoslavia				Aug. 3-Oct. 18, 1924: Cases, 17; deaths, 2.
Belgrade	Nov. 24-Dec. 28	5		

YELLOW FEVER

Place	Date	Cases	Deaths	Remarks
Gold Coast	October - November, 1924.	4	4	
Salvador:				
San Salvador	June-October, 1924.	77	28	Last case, Oct. 22, 1924.

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